
Subchapter 2: Habitat

HABITAT FACTORS FOR DECLINE, OBJECTIVES AND PERFORMANCE MEASURES, CONSERVATION STRATEGIES AND ACTIONS

Introduction

A key issue to be addressed by the LCSCI is the protection and restoration of habitat to meet the biological needs of steelhead. This subchapter of Chapter 14 identifies and discusses six key habitat factors contributing to the decline of steelhead; objectives and performance measures that must be achieved to address each habitat factor; and conservation strategies that can be undertaken to achieve the objectives.

The key habitat factors to be addressed are: (1) fish access and barriers to passage; (2) decreased channel and floodplain complexity; (3) riparian areas and wetlands degradation; (4) impaired water quality; (5) sediment transport and fine sediments; and (6) basin hydrology and stream flow. These six factors and their associated objectives, performance measures and conservation strategies are not listed in a particular order. The order of presentation does not indicate the priority of the factor or strategies.

Performance Measures

Performance measures for each objective under each habitat factor for decline are needed. Performance measures must focus on the habitat conditions and results to be achieved for steelhead recovery. Performance measures are tools for evaluating progress in achieving the habitat conditions needed by salmonids and then making adaptive management decisions. Performance measures are most useful when they are quantifiable both in terms of habitat conditions and the timeframe for achieving the desired results. Performance measures that are not incorporated into state rules or local ordinances are not enforceable.

Performance measures that are quantifiable, adequate, and specific to the LCSCI area cannot be developed without conducting an in-depth assessment of habitat conditions and factors for decline for the priority stocks and streams (Tiers 1-5, as referenced in Chapter 12) in the area. An initial assessment and the development of quantifiable performance measures tailored to the LCSCI area that will serve as interim performance measures will be done by fishery and habitat experts by June, 1998. More refined performance measures for salmonid recovery will be developed by the state, regional, local, and watershed organizations responsible for implementing the LCSCI that are specific to LCSCI area priority streams. Relevant performance measures from the Wild Salmonid Policy (WSP) adopted by the Washington Fish and Wildlife Commission on December 5, 1997, or as they are subsequently modified, will be used as default performance measures. The WSP performance measures serve as default measures until more specific performance measures consistent with goals for salmonid recovery are developed for the LCSCI area.

The default performance measures or more specific performance measures to be developed may reflect current state rules and local ordinances. None of these performance measures create new enforceable requirements unless or until they are incorporated into state rules or local ordinances.

Note: The WSP performance measures used as default performance measures in the LCSCI do not apply to forest practices that are the subject of current negotiations through the Timber/Fish/Wildlife Forestry Module process. Successful negotiations through that process may develop performance measures that will be adopted as rules by the Forest Practices Board and will supercede the default performance measures included in the LCSCI. If TFW negotiations are unsuccessful the applicability of these LCSCI performance measures to forest practices and lands will be reconsidered.

Conservation Actions and Cross References

The conservation actions that are being taken or that are proposed to achieve these habitat objectives and performance measures and to implement the conservation strategies are cross referenced under each conservation strategy which they implement. The conservation action code, responsible organization, and title are referenced. The cross references for state actions are basically completed. Cross references for local government actions are less complete and cross references for federal governments actions are not yet provided. More complete cross references will be included in subsequent LCSCI documents. Brief descriptions and other information for each conservation action are provided in Appendix 4. Conservation actions of state, federal and local government agencies as well as actions of private organizations are included in Appendix 4. More specific descriptions of priority conservation actions that are organized by the Tier 1-5 watersheds where the actions will apply are provided in Chapter 15.

An alphanumeric code for each action of state, federal and local government organizations described in Appendix 4 is used to identify the actions that implement and are proposed for each strategy. The first three letters of the code identify the responsible organization as listed below. The first number identifies whether the action is a Phase 1 or Phase 2 action (i.e., 100 series numbers are Phase 1 actions, 200 series numbers are Phase 2 actions). The last two digits are used to identify the specific action.

State Organization Codes

AGR- Washington Department of Agriculture
CRE - Columbia River Estuary Program
CTE - Washington Department of Community, Trade and Economic Development
CCO - Washington State Conservation Commission
ECY – Washington Department of Ecology
DFW – Washington Department of Fish and Wildlife
IAC – Interagency Committee for Outdoor Recreation
DNR – Washington Department of Natural Resources
DOT – Washington State Department of Transportation

Federal Organization Codes

USF – United States Department of Agriculture, Forest Service
EPA – United States Environmental Protection Agency

Local Government Organization Codes

CCC - Clark County Commission
CPU – Clark Public Utilities
CCD – Clark County Conservation District
COC – Cowlitz County Commission
CWD – Cowlitz Conservation District
CWC – Cowlitz and Wahkiakum Conservation Districts
LCC – Lewis County Commission
RDG – City of Ridgefield
SKP – Skamania County Planning Department
UCC – Underwood Conservation District
VCP – Vancouver-Clark Parks and Recreation Department
WCD – Wahkiakum Conservation District

VII. Factor for Decline: Fish Access and Barriers to Passage

Description

The focus of this factor is on barriers to fish passage related to road crossings and associated facilities. Fish passage issues related to hydropower facilities are being addressed as part of the discussion of hydropower issues.

In the past, little consideration was given to fish passage in the design of stream crossings for roads and other facilities. In some cases, culverts which were not barriers to fish when built have experienced down cutting of the stream channel, flow changes and other problems which have created full or partial blockages. Blockages associated with stream crossings represent a substantial contributor of lost habitat for salmonids. This problem is especially acute for steelhead which tend to penetrate farther upstream into the watershed and make use of more habitat within watersheds than most other anadromous salmonids.

WDFW estimates that road crossings block a minimum of 3,000 miles of stream habitat in Washington. An estimated 10% of the barriers involve state roads, with about 40% on county and municipal roads and the remainder on federal and private roads.

Correction of existing barriers is one of the most cost-effective ways to restore salmon habitat. In many cases the blocked habitat is in good condition and can be utilized by salmon as soon as access is gained. Fixes are feasible, but costs can be quite variable depending on the scale of the

problem at each site. Estimates by WDFW are that there is a fourfold benefit for every dollar spent for fish passage correction

Objective:

- A. Ensure steelhead have access to available and functional habitat for spawning, rearing and migration.

Interim Performance Measure:

By June, 1998 develop quantifiable measures and benchmarks that comparatively assess functional habitat for LCSCI areas with barriers to fish access where access can and will be restored.

Default Performance Measure:

Provide and maintain free and unobstructed passage for all wild salmonids, according to state and federal screening and passage criteria, and guidelines at all human-built structures.

Conservation Strategies:

1. Identify barriers for fish passage associated with road crossings and set priorities for correcting known barriers. This should be an integral part of watershed planning.

Conservation Actions:

ECY-255, Department of Ecology, Phase 2, Barriers, Culverts and Stream Retyping

DFW-102, Department of Fish and Wildlife, Phase 1, Centralized Database for Fish Barriers

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

COC-105, Cowlitz County Commissioners, Phase 1, Road Drainage and Fish Passage Improvements

- a. Assemble existing information on identified barriers and identify potential gaps in information.

Conservation Actions

DFW-115, Department of Fish and Wildlife, Phase 1, Fish Passage Barriers

DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory

DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force

DOT-201, Department of Transportation, Phase 2, Fish Passage Task Force Grant Program

CCC-203, Clark County Commission, Phase 2, Transportation-6 Year Road Improvement Program

LCC-103, Lewis County Commission, Phase 1, Preliminary Culvert Inventory for the Cowlitz River Watershed

LCC-200, Lewis County Commission, Phase 2, Comprehensive Culvert Inventory

b. Distribute information on "Priority Index" (PI) system to all road management entities.

Conservation Actions:

DFW-115, Department of Fish and Wildlife, Phase 1, Fish Passage Barriers
DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory
DOT-201, Department of Transportation, Phase 2, Fish Passage Task Force Grant Program
CCC-203, Clark County Commission, Phase 2, Transportation-6 Year Road Improvement Program
LCC-200, Lewis County Commission, Phase 2, Comprehensive Culvert Inventory
LCC-201, Lewis County Commission, Phase 2, Priority One Culvert Replacement Program

c. Seek agreements with agencies and others to link survey work with corrective actions.

Conservation Actions:

DFW-115, Department of Fish and Wildlife, Phase 1, Fish Passage Barriers
DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory
LCC-200, Lewis County Commissioners, Phase 2, Comprehensive Culvert Inventory

d. Prioritize barriers for correction with the "Priority Index" system currently in use by WDFW, WSDOT and others.

Conservation Actions:

DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force
LCC-200, Lewis County Commissioners, Phase 2, Comprehensive Culvert Inventory

e. Through training and outreach, expand the capabilities of various organizations to conduct barrier inventory and survey work.

Conservation Actions:

DFW-115, Department of Fish and Wildlife, Phase 1, Fish Passage Barriers
DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force

f. Develop a comprehensive inventory of barriers in a watershed as part of watershed management.

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2. Systematically correct barriers to ensure unrestricted passage for salmonids of road crossings in the LCSCI area.

Conservation Actions

ECY-255, Department of Ecology, Phase 2, Barriers, Culverts and Stream Retyping
COC-105, Cowlitz County Commissioners, Phase 1, Road Drainage and Fish Passage Improvements

- a. Make available information on culvert design and maintenance for fish passage (materials, training and technical assistance) to all road management entities.

Conservation Actions

DFW-115, Department of Transportation, Phase 1, Fish Passage Task Force
DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory
DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- b. Using priorities set through survey data collection, work cooperatively with local, state and federal agencies and other landowners to correct barriers in the study area within an established timeframe.

Conservation Actions

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-115, Department of Transportation, Phase 1, Fish Passage Task Force
DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory
DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force
DOT-201, Department of Transportation, Phase 2, Fish Passage Task Force Grant Program
CCC-203, Clark County Commissioners, Phase 2, Transportation-6 Year Road Improvement Program
LCC-200, Lewis County Commissioners, Phase 2, Comprehensive Culvert Inventory
LCC-201, Lewis County Commissioners, Phase 2, Priority One Culvert Replacement Program

- c. Integrate culvert retrofits with planned road construction projects.

Conservation Actions

CTE-102, Department of Community, Trade and Economic Development, Phase 1, Community Development Block Grants
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-203, Clark County Commissioners, Phase 2, Transportation-6 Year Road Improvement Program

d. Actively pursue creative funding opportunities to cost-share passage restoration efforts and create partnerships.

Conservation Actions

DFW-207, Department of Fish and Wildlife, Phase 2, Grants

DFW-209, Department of Fish and Wildlife, Phase 2, Restoration Grants

DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory

DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

DOT-201, Department of Transportation, Phase 2, Fish Passage Task Force Grant Program

LCC-201, Lewis County Commissioners, Phase 2, Priority One Culvert Replacement Program

e. Develop coordination networks to integrate habitat restoration efforts throughout watershed with fish passage projects to leverage (cost/share) benefits of each action.

Conservation Actions

DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory

DOT-102, Department of Transportation, Phase 1, Fish Passage Task Force

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

LCC-201, Lewis County Commissioners, Phase 2, Priority One Culvert Replacement Program

f. Incorporate follow-up monitoring of barrier corrections to ensure proper functioning and to learn from experience. This follow-up monitoring should be linked back to the survey data record keeping so status of corrections is tracked.

Conservation Actions

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring
DOT-101, Department of Transportation, Phase 1, State Highway Fish Passage Inventory

3. Ensure future projects are in compliance with regulations and guidelines for fish passage.

Conservation Actions

SKP-101, Skamania County, Phase 1, Columbia River Gorge National Scenic Area Ordinance

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance

SKP-104, Skamania County, Phase 1, Comprehensive Plan "A"

UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project

UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

- a. As proposed in the Final Environmental Impact Statement (FEIS) for the Wild Salmonid Policy, WDFW will provide fish passage criteria to all major road and railroad construction entities on stream crossing specifications necessary to ensure fish passage.

Conservation Actions

DFW-104, Department of Fish and Wildlife, Phase 1, Informational Materials

DFW-115, Department of Fish and Wildlife, Phase 1, Fish Passage Barriers

- b. WDFW will consult with local, state and federal entities and major landowners on all future projects crossing fish bearing waters to promote compliance with the state Hydraulic Code.

Conservation Actions

DFW-111, Department of Fish and Wildlife, Phase 1, Root Wads and Willows Seminars

DFW-116, Department of Fish and Wildlife, Phase 1, Enforcement

COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy

- c. On a priority basis, WDFW will enforce the Hydraulic Code for fish passage at existing barriers if resolution cannot be reached cooperatively.

Conservation Action

DFW-109, Department of Fish and Wildlife, Phase 1, Mitigation

VIII. Factor for Decline: Decreased Channel and Floodplain Complexity

Description

Human-induced disturbance has caused dramatic changes in the morphology of stream channels and adjacent floodplains to the impairment of wild steelhead. Changes to stream channels and floodplains include simplification, devegetation, decreased structural complexity, reduced interchange among historic channels, wetlands, and floodplains, decreased channel depth and increased channel width, and channel down-cutting. Decreased channel and habitat complexity reduce stream capacity to harbor the diverse life history strategies of wild steelhead.

Channel roughness includes bed form and large wood elements that contribute to channel complexity and diversity. Boulders, bedrock outcrops, large wood, root wads, and vegetated banks are the primary resistance to flow that shape and form channel structure. Habitat features resulting from this flow resistance includes pool formation, increased pool volume and frequency, channel and habitat complexity, cover, and velocity refugia. Juvenile steelhead generally reside in freshwater for 2-3 years and often longer. Their dependence on varied habitat attributes during this period of their life history is well documented. Habitat diversity is achieved and maintained only through persistent stream-deflecting roughness elements as outlined above.

Vegetation removal from instream and riparian areas has had a profound effect in simplifying formerly complex channel habitats. Historically, large woody debris has been the primary channel forming agent in streams within the LCSCI area. Large woody debris has been systematically removed from stream channels, and recruitment potential of new large wood has been diminished through harvest practices adjacent to stream channels. Vegetation has also been cleared in riparian areas to accommodate development and agricultural practices such as farming and grazing. The loss of large woody debris and the reduced effectiveness of other forming agents has produced a significant long-term detriment to steelhead. For estuarine wetlands, diking, filling and dredging activities have had the greatest impact on morphology and complexity.

Human-caused changes to channel and floodplain complexity have resulted in simplified salmonid habitat. Bisson and Sedell (1984) observed reduced pool frequencies and pool area and volume as result of woody debris removal in Western Washington stream channels. Past timber harvest and removal of wood from stream channels of the upper Kalama River have simplified habitats and decreased pool frequencies below those expected in natural systems (USFS 1996). Watershed analysis revealed that 61% of pools had a poor rating for frequency, and 40% of pools within the study area fall below complexity standards (<40 pcs. large wood /mi) (USFS 1996). Watershed analysis of East Fork Lewis River showed that 92% of surveyed streams had poor large wood frequencies in stream channels (USFS 1995). Habitat inventories of Arkansas and Hemlock Creeks also revealed poor abundance of large wood (Aylesworth et al. 1995, and Houpt et al. 1994).

Future recruitment of large wood in LCSCI area stream channels is directly related to current riparian vegetation structure. In the upper East Fork Lewis River, 87% of stream miles have low to moderate potential for large wood recruitment due to past fires (Yacolt burns) and resulting

succession of hardwood species (USFS 1995). Similarly, almost no potential for future large wood recruitment exists in the short term in the upper Kalama basin due to past logging practices (USFS 1996).

Gravel mining within floodplains has altered stream channels to the detriment of salmonids. Gravel mining has caused shifts from braided channels to single channels in the White and Skykomish basins (Collins and Dunne 1990). Salmonids depend on channel diversity to survive changes in their life history and to survive environmental extremes such as floods and drought. In addition to channel simplification, alterations to the substrate has resulted in detrimental impacts to salmonids. Gravel mining has reduced coarse sediment supply in sites above in-channel mining locations (Collins and Dunne 1990). Spawning habitat and survival of egg and alevin life history stages are reduced in response to increased bedload movement.

Objective:

- A. Natural watershed processes are protected and restored to promote the channel and floodplain complexity on which healthy populations of steelhead and other salmonids rely.

Interim Performance Measure:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI watersheds of channel and floodplain complexity factors needed for healthy steelhead and other salmonid populations.

Default Performance Measures:

1. It is the objective that spawning gravel be relatively stable, with a low potential for scour, throughout the nest building and incubation period of the wild salmonid species in the basin. Salmonid production will be considered impaired if the frequency or depth of scour exceeds the natural disturbance rate and magnitude.
2. It is the objective that adult salmonid holding pools contain sufficient depth (depending on species and stream, but generally greater than one meter) and associated cover.
3. It is the objective that more than 90% of channel banks on streams be stable through natural processes (vegetation root strength), relative to natural rates of erosion in the basin. Stability, if needed, can be provided in a number of ways. The need for stability should not override natural processes. If bank protection is necessary, bioengineering methods are preferred. Bank protection measures that are detrimental to salmonid habitat should be prohibited unless adverse impacts are fully mitigated using proven methods.
4. At a minimum, the performance measures relative to pools and large woody debris in forested and previously forested areas, should conform to those in the *Washington State Watershed Analysis Manual* (listed below, from WAC 222-22), unless locally defined based on the best available science. The quality and quantity of large woody debris in streams and the potential for future recruitment should not be impaired by human activities regardless of which performance measure is used.

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- a. In streams of any gradient, but less than 15 meters wide, the frequency of pools should not occur at intervals less than one pool for every two channel widths in length.
 - b. The percent pools in a stream will not be impaired by the presence of sediments, or the effects of human disturbances. For streams less than 15 meters wide, the percent pools should be greater than 55%, greater than 40%, and greater than 30% for streams with gradients of less than 2%, 2-5% and more than 5%, respectively.
 - c. The quantity and quality of LWD in streams should not be impaired by human activities. For streams less than 20 meters wide, the number of pieces of LWD larger than 10 centimeters for every channel width, should exceed two; the number of key LWD pieces per “bank full width” (BFW) should be greater than 0.3 pieces for streams less than 10 meters BFW, and greater than 0.5 pieces for streams 10-20 meters BFW. Key piece size criteria are defined in the *Washington State Watershed Analysis Manual*.
1. Side channels and other off-channel habitat, including wetlands, should remain connected and passable by salmonids to the channel proper. Where feasible, dikes or levees, bridge approaches, and other structures that are constricting floodplains, should be removed or modified to allow flood flow, storage, recharge, and release.
 2. It is the objective to manage stormwater so that there will be no increase in the number, frequency, or duration of flows that form channels or create scour, nor exceed those flows conducive to salmonid rearing. Maintenance of other stream channel complexity features, identified under policy statement #10, should also be maintained and restored to natural frequency and distribution in stream channels.

Conservation Strategies:

1. Quantify and qualify current habitat conditions relating to channel complexity and roughness in streams of the LCSCI area.

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DOT-109, Department of Transportation, Phase 1, Erosion Control Outreach

- a. Develop basin-wide habitat inventory protocols that quantify the abundance, and qualify the health of riparian and instream habitat.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-102, Department of Ecology, Phase 1, Biodiversity and Habitat Monitoring

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- b. Determine roughness criteria for stream systems in the LCSCI area.

Conservation Action

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

- c. Inventory fish bearing streams in the LCSCI area, including headwater streams, to determine where objectives for roughness and complexity, especially large woody debris, are met and unmet.

Conservation Action

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

- d. Evaluate wood recruitment potential for all streams in the LCSCI area using aerial photo interpretation or inventory information.

Conservation Action

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

- e. Develop habitat assessment techniques in large rivers as they relate to salmonids and explore protection and enhancement measures with local groups and governments.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

ECY-251, Department of Ecology, Phase 2, TMDL Development

- f. Based on the spatial analysis of the collected riparian and instream data and aerial photo interpretation, prioritize streams and reaches for protection and recovery as developed through watershed analysis.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-104, Department of Ecology, Phase 1, 303(d) Listing and TMDLS

ECY-204, Department of Ecology, Phase 2, Expand TMDL Program
ECY-251, Department of Ecology, Phase 2, TMDL Development
DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis
LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed
LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- g. Develop local landowner and government support for sanctuary reaches within healthy streams with good channel complexity.

Conservation Actions

CRE-101, CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-251, Department of Ecology, Phase 2, TMDL Development
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

2. Minimize deleterious impacts to channel morphology (including development in floodplains, gravel removal from current and historic channels, road construction, vegetation removal, and removal of structural elements).

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management
SKP-101, Skamania County, Phase 1, Columbia River Gorge National Scenic Area Ordinance
SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance
SKP-103, Skamania County, Phase 1, State Environmental Policy Act (SEPA) Ordinance – SEPA Rules
SKP-104, Skamania County, Phase 1, Comprehensive Plan “A”
SKP-107, Skamania County, Phase 1, Shoreline Management Act Permit Ordinance – Shoreline Management
SKP-201, Skamania County, Phase 2, Shoreline Management Act Permit Ordinance – Shoreline Management

- a. Support the implementation and continuing evaluation of the “Habitat Conservation Ordinance” recently developed under the Growth Management Act by Clark County and utilize the process to evaluate sound habitat management.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
DFW-105, Department of Fish and Wildlife, Phase 1, Community Events
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
DFW-203, Department of Fish and Wildlife, Phase 2, Community Events
CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

- b. Increase emphasis for counties to protect current and future floodplain integrity by amending state law to promote improved flood planning. Promote passage of fish-friendly local ordinances under the Growth Management Act that improve planning and management to avoid or minimize the adverse impacts to floodplains from vegetation removal, new road construction, diking, and residential development within the 100 year floodplain.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-127-129, Department of Ecology, Phase 1, Regulatory Approaches, to Minimize Land Use Impacts, FCAAP Comprehensive Flood Management Plan Funding, FCAAP Comprehensive Flood Management Project Funding
ECY-229-231, Department of Ecology, Phase 2, Updated Shoreline Master Programs, FCAAP Comprehensive Flood Management Plan, FCAAP Comprehensive Flood Management Project
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
DOT-203, Department of Transportation, Phase 2, Flood Management Plan
CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance
CCC-103, Clark County Commissioners, Phase 1, Stormwater Control Ordinance
CCC-104, Clark County Commissioners, Phase 1, Erosion Control Ordinance
CCC-106, Clark County Commissioners, Phase 1, Geological Hazard Ordinance
CCC-109, Clark County Commissioners, Phase 1, Floodplain Combining District
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance
COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy
COC-103, Cowlitz County Commissioners, Phase 1, Shorelines Management
COC-104, Cowlitz County Commissioners, Phase 1, Comprehensive Plan
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan
LCC-101, Lewis County Commissioners, Phase 1, Amendment to the Shorelines Master Program
LCC-102, Lewis County Commissioners, Phase 1, Streambank Stabilization Committee – Outreach and Education
LCC-202, Lewis County Commissioners, Phase 1, Implementation of the Filling and Grading Ordinance

LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- c. Minimize floodplain gravel extraction in cooperation with city, county, and state governments. In addition, work with mining dependant businesses to minimize gravel removal from current and historic channels.

Conservation Actions

ECY-127-129, Department of Ecology, Phase 1, Regulatory Approaches, to Minimize Land Use Impacts, FCAAP Comprehensive Flood Management Plan Funding, FCAAP Comprehensive Flood Management Project Funding

ECY-229-231, Department of Ecology, Phase 2, Updated Shoreline Master Programs, FCAAP Comprehensive Flood Management Plan, FCAAP Comprehensive Flood Management Project

DFW-113, Department of Fish and Wildlife, Phase 1, Gravel Mining

CCC-111, Clark County Commissioners, Phase 1, Comprehensive Plan Policies

COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy

COC-103, Cowlitz County Commissioners, Phase 1, Shorelines Management

COC-104, Cowlitz County Commissioners, Phase 1, Comprehensive Plan

- d. Actively solicit voluntary cooperation among landowners who are managing private lands with sound stewardship to continue progressive activities, and to make their land and management strategies available as demonstration projects to show other potential stewards.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CPU-101, Clark Public Utilities, Phase 1, Assistance to Landowners

LCC-102, Lewis County Commissioners, Phase 1, Streambank Stabilization Committee – Outreach and Education

- e. Request allocated funding for acquisition of critical riparian and wetland areas in the LCSCI area as identified in 3.c. below and in IX.A.3.g.

Conservation Actions

IAC-101, Interagency Committee for Outdoor Recreation, Phase 1, Washington Wildlife and Recreation Program

IAC-102, Interagency Committee for Outdoor Recreation, Phase 1, Riparian Habitat Program

IAC-201, Interagency Committee for Outdoor Recreation, Phase 2, Washington Wildlife and Recreation Program

IAC-202, Interagency Committee for Outdoor Recreation, Phase 2, Riparian Habitat Program

DFW-205, Department of Fish and Wildlife, Phase 2, Enhanced WDFW-Owned Land

DFW-206), Department of Fish and Wildlife, Phase 2, Acquisition

CCC-210, Clark County Commissioners, Phase 2, Public Lands

Ownership/Conservation Futures Program

VCP-101, Vancouver-Clark Parks and Recreation Department, Phase 1, Acquisition of Open Space Areas

VCP-102, Vancouver-Clark Parks and Recreation Department, Phase 1, Restoration of Riparian Areas

- f. Working cooperatively with landowners, initiate proactive management plans that protect high potential, roughness complexity recruitment areas.

Conservation Actions

CPU-101, Clark Public Utilities, Phase 1, Assistance to Landowners

LCC-102, Lewis County Commissioners, Phase 1, Streambank Stabilization Committee – Outreach and Education

- g. Contribute bioengineered alternatives to Hydraulic Permit plans when the applications contain elements that limit or reduce the presence or potential of roughness and complexity material.

Conservation Actions

DFW-104, Department of Fish and Wildlife, Phase 1, Informational Materials

DFW-111, Department of Fish and Wildlife, Phase 1, Root Wads and Willows Seminars

- h. Increase enforcement of the state Hydraulic Code to minimize deleterious alteration of stream roughness elements.

Conservation Actions

DFW-109, Department of Fish and Wildlife, Phase 1, Mitigation

DFW-116, Department of Fish and Wildlife, Phase 1, Enforcement

- i. Review Corp of Engineers proposal to deepen the Columbia River channel and determine significance and develop alternatives to benefit steelhead.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-127, Department of Ecology, Phase 1, Regulatory Approaches to Minimize Land use Impacts

- 3. Restore degraded stream channels.

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

- a. Within geomorphic constraints, solicit voluntary landowner cooperation to restore native vegetative communities, and floodplain interaction in areas revealing past linkages.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance

DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-208, Clark County Commissioners, Phase 2, East Fork Lewis River Project

CPU-101, Clark Public Utilities, Phase 1, Assistance to Landowners

- b. Work with industrial landowners to cooperatively remove unused roads in floodplains and revegetate using native vegetation that includes conifers.

Conservation Actions

DFW-114, Department of Fish and Wildlife, Phase 1, Road Assistance

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- c. Promote the current floodplain purchase in the lower East Fork Lewis River by Clark County and actively participate in the management of these lands to benefit wild steelhead (see Sanctuary Waters).

Conservation Actions

ECY-128, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Plan Funding

ECY-129, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Project Funding

ECY-230, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Plan

ECY-231, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Project

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance

CCC-208, Clark County Commissioners, Phase 2, East Fork Lewis River Project

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- d. As proposed in the FEIS for the Wild Salmonid Policy (WSP), work cooperatively with landowners, and local, state and federal agencies to restore functional channel interactions with floodplains and adjacent wetlands.

Conservation Actions

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance

DFW-113, Department of Fish and Wildlife, Phase 1, Gravel Mining

DOT-202, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

DOT-203, Department of Transportation, Phase 2, Flood Management Plan

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-102, Clark County Commissioners, Phase 1, Wetlands Protection Ordinance

CCC-103, Clark County Commissioners, Phase 1, Stormwater Control Ordinance

LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

- e. Identify, through flood plans, where levees can be set back or lowered to restore riparian and wetland functions or dikes can be removed and tide gates opened.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-128, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Plan Funding

ECY-129, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Project Funding

ECY-226, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment

ECY-230, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Plan

ECY-231, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Project

DFW-112, Department of Fish and Wildlife, Phase 1, Levees

LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

- f. Establish state standards for levee vegetation which require regionally appropriate vegetation to increase stream health without degrading structural integrity of levees.

Conservation Actions

ECY-127, Department of Ecology, Phase 1, Regulatory Approaches to Minimize Land Use Impacts

ECY-130, Department of Ecology, Phase 1, Levee Vegetation Standards Intergovernmental Committee
DFW-112, Department of Fish and Wildlife, Phase 1, Levees
LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

- g. Increase mitigation measures to directly benefit steelhead and other salmonids when violations to the hydraulic permit occur.

Conservation Action

DFW-109, Department of Fish and Wildlife, Phase 1, Mitigation

- h. Work cooperatively with landowners and volunteer groups to initiate the return of large woody debris to reaches deficient in channel shaping material using the labor and resources of volunteer groups, funding from grant awards, and department expertise.

Conservation Actions

ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- i. Working cooperatively with landowners, guide and motivate volunteer groups in fencing and planting riparian areas to initiate future recruitment of large woody debris and restore riparian functions.

Conservation Actions

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- j. As proposed in the FEIS for the WSP, coordinate and expedite regulatory permits for habitat restoration activities.

Conservation Actions

ECY-127, Department of Ecology, Phase 1, Regulatory Approaches to Minimize Land use Impacts
ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs

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4. Monitor the effectiveness and abundance of large woody debris.

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- a. Monitor riparian stand conditions to evaluate large woody debris recruitment potential.

Conservation Actions

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

- b. Review functionality and abundance of instream large woody debris.

Conservation Actions

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

IX. Factor for Decline: Riparian Areas and Wetland Degradation.

Description

The condition of riparian habitat has been degraded and, in some cases, lost due to human activities adjacent to stream channels. Riparian vegetation moderates stream temperature increases by blocking direct solar radiation, by buffering ambient air temperature, and by combining with soils to store and release ground water. Riparian vegetation also contributes channel roughness in the form of large woody debris, intercepts fine sediment from upland sources, provides food and nutrients to stream channels, and stabilizes stream banks from erosion.

On managed timberlands, inadequate protection of riparian habitat is especially prominent in headwater streams (water type 4 and 5) where watershed processes begin and influence streams along a continuum. Poorly vegetated riparian areas are also found along valley bottoms in agricultural lands and along urbanizing streams. The loss of riparian vegetation can result in increased erosion and sedimentation, elevate stream temperatures, diminish the input of large woody debris, reduce filtration of surface runoff, and reduce nutrient inputs to the stream.

Due to human activities, many wetlands have been filled, disconnected from streams, or otherwise altered to the detriment of salmonids. Diking and bank armoring are used to de-water and protect croplands and grazing land, but they often disconnect stream channels from their flood plains and prevents these lands from being supplied with the silts that made them productive in the first place. These factors reduce rearing and overwintering habitat and diminishes other important wetland and floodplain functions such as retention of flood waters, fine sediment entrapment, removal of pollutants, and seasonal maintenance of stream flows (with water temperature reduction). Diking, draining, filling, and encroachment land uses are the most common activities that have changed the abundance and quality of wetlands. In the Columbia River estuary, over 50% of the original wetland marshes and wetland forests have been lost to development activities since 1880. Loss of floodplain connectedness has resulted in higher storm flow velocities, less refugia or protection for fish from storm flows, and increased channel scour and down-cutting.

Objective:

- A. Riparian, wetland and floodplain functions that contribute to the habitat needs and healthy populations of steelhead and other salmonids are protected and restored.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI riparian areas and wetlands contributions to healthy steelhead and other salmonid populations.

Default Performance Measures:

There are no single, agreed-upon, statewide numeric standards for riparian areas or wetlands. Because the Department of Natural Resources maintains and updates a water typing system (defined and mapped per WAC 222-16-030), and since many local governments use this system, that system is used as a point of reference. It should be noted that the performance measures recommended below provide general guidance for riparian buffers that protect aquatic functions and salmonid habitat. These buffers should be applied regardless of land use (e.g., forest lands, agricultural, rural, or urban lands).

Regional or watershed specific standards may need to be applied, based upon (a) watershed analysis; (b) the development of specific and detailed standards in individual watershed plans; or (c) other assessments of site conditions and intensity of land use. The factors limiting the maintenance of salmonids will be considered when developing the standards. Individual riparian and wetland performance measures can be amended, by local watershed groups to reflect local habitat conditions, provided the amendments remain consistent with habitat goals.

It is anticipated that statewide standards for state and private forest lands will be developed through TFW consensus recommendations on the Forestry Module, and provided to the Forest Practices Board for formal rule making. Once these are developed, they will provide the standards for forestry management. In the event the Forestry Module discussions do not result in consensus recommendations, these performance measures are recommended as necessary to maintain or restore salmonid habitat. In developed, non-forested areas under jurisdictional control of local governments, existing encroachments in riparian areas, or parcel size and configuration, may preclude attainment of adequate riparian buffers.

Nonetheless, in the absence of any other quantified alternative that provides the riparian area functions described above, the performance measures below are recommended to maintain riparian functions and conditions which protect salmonid habitat:

1. Riparian Areas

- For Water Types 1-3, a buffer of 100 – 150 feet (measured horizontally), or the height of a site potential tree representative of the mature dominant native vegetation capable of growing on those soils, whichever is greater, on each side of the stream's full channel migration or disturbance zone.
- For Type 4 streams, a buffer of at least 100 feet (each side).
- For Type 5 streams, a buffer of at least 50 feet (each side).
- For streams not identified directly or indirectly per WAC 222-26-030, apply a buffer of 100-150 feet each side on salmonid streams larger than 5 feet wide, a buffer of 100 feet (each side) on smaller perennial streams, and a buffer of 50 feet (each side) on all other streams.
- Based on local habitat conditions, buffers may need to be expanded to accommodate the anticipated channel migration or disturbance zone, to increase recruitment of woody debris, as an additional buffer against windthrow, or to address upslope instability, or previous negative upslope impacts.
- Type 4 and 5 streams, with low stream gradient and relatively flat slope topography, may not need the full buffer width specified, and the buffer width may be reduced to that necessary to protect the stream from upslope sedimentation and significant changes in stream temperature. The actual buffer width and composition should be based on site- specific conditions.
- To the extent possible, buffers should be continuous along the stream channel. Selective tree removal may occur where site review and prescription clearly demonstrates removal can occur without significantly affecting the function of the riparian area, or that removal and/or removal and subsequent rehabilitation will improve the functional characteristics of the riparian area. Averaging buffers to meet buffer requirements will not be permitted except where it would result in greater protection. Complete tree removal should be limited to the minimum amount necessary for road alignments, stream crossings, or other corridors where no feasible alternative exists and adverse impacts will be fully mitigated.
- Riparian area restoration is strongly recommended after careful consideration and when consistent with established guidelines. Plant community structural complexity (understory herbaceous and woody overstory canopy), density, tree height and diameter should be similar to what would occur at the site under natural conditions (also known as site potential).
- Grazing, if allowed, should be managed to maintain or allow reestablishment of functional riparian vegetation. Other management activities may occur within the riparian area, provided the functional characteristics of the riparian area necessary to protect the stream are not significantly impaired.

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- The performance measures for Basin Hydrology, Water Quality, Sediment Transport and Stream Channel Complexity, should also be met to ensure riparian functions will be meaningful and attainable.
 - Shade criteria shall be developed considering stream width.

2. Wetlands

- Buffers for wetlands should be applied in accordance with the Department of Ecology Model Wetlands Ordinance – September 1990, and the updated 4-tier rating system (Pub. #93-74 for western Washington, and Pub. #91-58 for eastern Washington). The ordinance should be applied as guidance. It is not a legally required state standards, and it is not solely designed to meet the specific needs of salmonid habitat protection and recovery. Habitat protection is encouraged through all means, not only through regulation. Generic application of the Model Wetlands Ordinance buffer widths and rating system, for salmonid habitat protection in all cases, may result in too much, or too little, protection of salmonid habitat in different site conditions.
- Use of the Model Wetlands Ordinance standards for the protection of salmonid habitat is intended as interim guidance. There is a need to develop improved wetlands protection guidance that is specific to the salmonid habitat needs addressed in this policy and the role wetlands play in maintaining or restoring watershed functions essential to wild salmonids.
- Wetlands replacement is highly discouraged because of the difficulty of providing adequate replacement of functions and values. Where replacement is unavoidable, the replacement ratio will result in at least as much replacement as provided in the Model Wetlands Ordinance. Wetlands mitigation banking is also an option which may be considered where on-site, in-kind mitigation will not be feasible or practicable. However, such banking should be within the same affected subbasin, unless otherwise recommended.
- Performance measures for Basin Hydrology, Water Quality, and Sediment Transport should be met, where applicable, to ensure wetlands extent and functions are meaningful and attainable.

These buffers are not intended to fully protect, or consider, the needs of terrestrial or aquatic wildlife, or non-salmonid fishes.

Conservation Strategies:

1. Assess riparian and wetland habitat in all potential steelhead streams and along the mainstem Columbia River in the LCSCI area.
- 2.

Conservation Actions

DFW-101, Department of Fish and Wildlife, Phase 1, WRIP Process

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

DFW-202, Department of Fish and Wildlife, Phase 2, Enhanced GIS Efforts

UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project

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- a. Inventory - Assess the functional contribution and condition of riparian and wetland habitat throughout the LCSCI area.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-226, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment

CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

- b. Update maps - Using GIS and interagency coordination, improve existing maps of all streams (including headwater streams) flowing into and wetlands connected to steelhead bearing waters.

Conservation Actions

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- c. Identify impacts – Within the watershed, identify land uses that are adversely impacting streams (all water types).

Conservation Actions

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy

LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- d. Prioritize reaches & identify deficiencies – Prioritize reaches or streams for protection and restoration action and identify functional deficiencies of steelhead habitat within the reaches or streams.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

- e. Identify key wetlands - Apply the Puget Sound Wetlands Restoration Project Methodology (modified as necessary) to the reaches to identify key wetlands that address the deficiencies identified in 1.d. above for direct preservation or restoration action.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-226, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment

- f. Identify protection gaps - in available protection programs/mechanisms (both regulatory and non-regulatory) and fill these gaps.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

2. Educate landowners and communities about the impacts of land use actions on steelhead habitat and salmonid populations and involve them in planning and recovery efforts.

Conservation Actions

CCC-208, Clark County Commissioners, Phase 2, East Fork Lewis River Project
LCC-102, Lewis County Commissioners, Phase 1, Streambank Stabilization Committee – Outreach and Education

- a. Salmon Information Materials – Develop and distribute informational materials to key audiences.

Conservation Action

DFW-104, Department of Fish and Wildlife, Phase 1, Informational Materials

- b. Community Involvement – Get citizens and communities involved in basin-wide preservation and restoration and have them assist in priority setting and planning.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-226, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-104, Department of Fish and Wildlife, Phase 1, Informational Materials

DFW-105, Department of Fish and Wildlife, Phase 1, Community Events

DFW-203, Department of Fish and Wildlife, Phase 2, Community Events

LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- c. Partnerships – Promote working with communities to implement projects.

Conservation Actions

CRE-102, Columbia River Estuary Program, Phase 1, Action, Demonstration, Planning Grants Program
ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities
ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands
ECY-251, Department of Ecology, Phase 2, TMDL Development
DFW-105, Department of Fish and Wildlife, Phase 1, Community Events
DFW-203, Department of Fish and Wildlife, Phase 2, Community Events
DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination
LCC-205, Lewis County Commissioners, Phase 2, Cowlitz River Watershed Planning Grant Application

- d. Educational Outreach - Conduct outreach discussions with civic groups, sports clubs, environmental organizations, extension services, and land use associations.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities
DFW-105, Department of Fish and Wildlife, Phase 1, Community Events
DFW-203, Department of Fish and Wildlife, Phase 2, Community Events
CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

- e. Support Groups - Actively and publicly support groups or management entities that strive to protect or restore riparian and wetland habitats.

Conservation Actions

CRE-102, Columbia River Estuary Program, Phase 1, Action, Demonstration, Planning Grants Program
ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program

- f. Promote Sanctuary Reaches - Develop local landowner and government support for sanctuary reaches within healthy streams.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

- g. Celebrate Recovery Efforts - Offer and support community events that demonstrate riparian and wetland linkages to the watershed and promote recovery efforts.
- h. Model Stewardship - Manage WDFW lands as a model for stewardship and promote them as demonstration projects.

Conservation Actions

DFW-107, Department of Fish and Wildlife, Phase 1, Prioritize WDFW Land Ownership

DFW-108, Department of Fish and Wildlife, Phase 1, Acquisition

DFW-205, Department of Fish and Wildlife, Phase 2, Enhanced WDFW-Owned Land

DFW-206, Department of Fish and Wildlife, Phase 2, Acquisition

- i. Forest Practice Enforcement - Develop and distribute a simplified pamphlet that describes enforcement measures that are taken when forest practice regulations protecting riparian and wetland habitat are violated.
3. Using voluntary stewardship approaches, preserve and restore riparian and wetland areas.

Conservation Action

UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

- a. Property Tax Incentives - Assist local governments in promoting Open Space Current Use Taxation incentives for property owners who preserve or restore key salmonid habitat features such as wetlands and riparian areas.

Conservation Actions

ECY-126, Department of Ecology, Phase 1, Voluntary Stewardship Approaches

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

CCC-201, Clark County Commissioners, Phase 2, Open Space Taxation

- b. Non-Compensatory Actions - Assist local governments in conducting non-compensatory wetlands and riparian habitat preservation and restoration where these areas benefit steelhead and address watershed problems for the community, such as flooding, water quality or quantity issues, etc.

Conservation Actions

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

VCP-102, Vancouver-Clark Parks and Recreation Department, Phase 1, Restoration of Riparian Areas

VCP-103, Vancouver-Clark Parks and Recreation Department, Phase 1, Restoration of Wetlands

COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy

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- c. Funding Support - Develop coordinated and comprehensive funding sources, using legislative solicitation as needed, to support local community stewardship actions, including riparian and wetland restoration.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program

IAC-101, Interagency Committee for Outdoor Recreation, Phase 1, Washington Wildlife and Recreation Program

IAC-102, Interagency Committee for Outdoor Recreation, Phase 1, Riparian Habitat Program

IAC-201, Interagency Committee for Outdoor Recreation, Phase 2, Washington Wildlife and Recreation Program

IAC-202, Interagency Committee for Outdoor Recreation, Phase 2, Riparian Habitat Program

DFW-110, Department of Fish and Wildlife, Phase 1, Grants

DFW-207, Department of Fish and Wildlife, Phase 2, Grants

VCP-104, Vancouver-Clark Parks and Recreation Department, Phase 1, IAC Grants for Acquisition of Open Space and Habitat

- d. Community Partnership – Work with local communities, landowners, citizen groups, and businesses whose practices affect steelhead habitat to implement priority projects for habitat preservation and recovery.

Conservation Actions

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- e. Landowner/Business Stewardship Assistance – Provide agency consultation and technical support to landowners and businesses willing to protect, preserve, or restore salmonid habitat on their lands.

Conservation Actions

ECY-126, Department of Ecology, Phase 1, Voluntary Stewardship Approaches

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CPU-101, Clark Public Utilities, Phase 1, Assistance to Landowners

- f. Preserve Healthy Streams - Solicit voluntary agreements with landowners and businesses to continue to preserve riparian and wetland areas in those areas that are functionally healthy to protect stream integrity and steelhead productivity.

Conservation Actions

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

- g. Acquisition - Actively target high quality riparian and wetland habitat for preservation using fee-simple or less-than-fee acquisition under existing funding programs; make existing pilot programs permanent; and increase funding levels for these programs.

Conservation Actions

ECY-128, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Plan Funding

ECY-129, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Project Funding

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

ECY-230, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Plan

ECY-231, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Project

IAC-101, Interagency Committee for Outdoor Recreation, Phase 1, Washington Wildlife and Recreation Program

IAC-102, Interagency Committee for Outdoor Recreation, Phase 1, Riparian Habitat Program

IAC-201, Interagency Committee for Outdoor Recreation, Phase 2, Washington Wildlife and Recreation Program

IAC-202, Interagency Committee for Outdoor Recreation, Phase 2, Riparian Habitat Program

DFW-108, Department of Fish and Wildlife, Phase 1, Acquisition

DFW-206, Department of Fish and Wildlife, Phase 2, Acquisition

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

CCC-210, Clark county Commissioners, Phase 2, Public Lands Ownership/Conservation Futures Program
VCP-104, Vancouver-Clark Parks and Recreation Department, Phase 1, IAC Grants for Acquisition of Open Space and Habitat

- h. Transferable Land Restrictions on Public Lands – Encourage land managers to transfer public land restrictions with the land when land swaps are necessary (e.g., USFS Riparian Reserves should accompany land swaps with private entities).
- i. Landowner Agreements - Broad-scale landowner management plans/agreements to adequately protect steelhead habitat through consultation with Ecology, WDFW, and DNR prior to taking land management actions.

Conservation Actions

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

- j. Material for Restoration – Augment supplies for restoration work by seeking donated materials, such as seedling trees, fencing to restore impacted reaches, etc

Conservation Action

DOT-204, Department of Transportation, Phase 2, Biomaterials Exchange

- k. Voluntary Cooperation to Restore - Solicit voluntary cooperation from landowners to restore stream-side vegetation and prevent the activities that degraded the riparian area from reoccurring.

Conservation Actions

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

- l. Partner with Restoration Groups - Work cooperatively and supportively with restoration groups (e.g., Clark PUD on Salmon Creek., Fish First on Cedar Creek., and PacRock and Habitat Partners on the East Fork Lewis River) to support projects meeting standards that are consistent with the goals of the LCSCI.

Conservation Actions

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance

DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

CPU-101, Clark Public Utilities, Phase 1, Assistance to Landowners

- m. Grant Support - Develop and award grants that support riparian and wetland restoration activities.

Conservation Actions

ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program

IAC-101, Interagency Committee for Outdoor Recreation, Phase 1, Washington Wildlife and Recreation Program

IAC-102, Interagency Committee for Outdoor Recreation, Phase 1, Riparian Habitat Program

IAC-201, Interagency Committee for Outdoor Recreation, Phase 2, Washington Wildlife and Recreation Program

IAC-202, Interagency Committee for Outdoor Recreation, Phase 2, Riparian Habitat Program

DFW-110, Department of Fish and Wildlife, Phase 1, Grants

DFW-207, Department of Fish and Wildlife, Phase 2, Grants

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

- n. Model Projects – Develop model restoration projects.

Conservation Actions

ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

DFW-205, Department of Fish and Wildlife, Phase 2, Enhanced WDFW-Owned Land

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

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4. Apply regulatory approaches which minimize land use impacts to riparian and wetland habitats utilized by steelhead.

Conservation Actions

ECY-130, Department of Ecology, Phase 1, Levee Vegetation Standards

Intergovernmental Committee

SKP-101, Skamania County, Phase 1, Columbia River Gorge National Scenic Area Ordinance

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance

SKP-107, Skamania County, Phase 1, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program

SKP-104, Skamania County, Phase 1, Comprehensive Plan “A”

SKP-201, Skamania County, Phase 2, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program

UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

- a. Growth Management Act/Shoreline Management Act (GMA/SMA) - Work with local governments to effectively incorporate steelhead and salmonid habitat protection measures into GMA/SMA plans and development regulations.

Conservation Actions

ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs

DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA

CCC-111, Clark County Commissioners, Phase 1, Comprehensive Plan Policies

CCC-120, Clark County Commissioners, Phase 1, Consistency Within Local Jurisdictions

CCC-202, Clark County Commissioners, Phase 2, Shoreline Combining District

COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance

COC-103, Cowlitz County Commissioners, Phase 1, Shorelines Management

LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

- b. Comprehensive Floodplains Management Plans (CFMP) - Incorporate steelhead habitat protection and restoration measures in CFMPs, and subsequent implementation projects, to maintain active floodplain functions, vegetated riparian areas, channel roughness, overwintering habitat, etc.

Conservation Actions

ECY-128, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Plan Funding

ECY-129, Department of Ecology, Phase 1, FCAAP Comprehensive Flood Management Project Funding

ECY-230, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Plan

ECY-231, Department of Ecology, Phase 2, FCAAP Comprehensive Flood Management Project
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
DOT-203, Department of Transportation, Phase 2, Flood Management Plan
LCC-204, Lewis County Commissioners, Phase 2, Comprehensive Flood Hazard Management Plan for the Cowlitz Watershed

- c. “Habitat Conservation Ordinance” Model – Recently developed under the GMA by Clark County, this ordinance can be evaluated as a model for salmonid management by other counties in their development of conservation plans.

Conservation Action

CCC-101, Clark County Commission, Phase 1, Habitat Conservation Ordinance

- d. Incentive-based Regulatory Options – Encourage the use of incentive-based regulations for accommodating rapid growth in urban areas such as density transfers and transfer development rights along stream corridors and wetland areas.

Conservation Actions

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA

CCC-118, Clark County Commission, Phase 1, Density Transfers

COC-101, Cowlitz County Commission, Phase 1, Critical Areas Ordinance

- e. Enforcement of Local Land-Use Laws – Seek better enforcement of provisions for conversions of forest land under the Forest Practices Act, Growth Management Act, vegetation clearing ordinances, Shorelines Master Plans, wetlands laws, and floodplain restrictions.

Conservation Actions

ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs

DFW-116, Department of Fish and Wildlife, Phase 1, Enforcement

CCC-117, Clark County Commission, Phase 1, Code Enforcement

COC-102, Cowlitz County Commission Phase 1, Environmental Policy

COC-103, Cowlitz County Commission, Phase 1, Shorelines Management

LCC-100, Lewis County Commission, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

LCC-101, Lewis County Commission, Phase 1, Amendment to the Shorelines Master Program

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- f. Forest Practice Buffers – Encourage the Washington Forest Practices Board to adopt greater riparian and wetland buffer widths as supported by the scientific literature to protect steelhead habitat and watershed processes in forested environments.
 - g. Develop and implement enforcement measures that restore riparian and wetland habitats from forest practice and other land use permit violations.

Conservation Action

CCC-117, Clark County Commission, Phase 1, Code Enforcement

- 1. Monitor riparian and wetland condition throughout the LCSCI area.

Conservation Actions

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

SKP-101, Skamania County, Phase 1, Columbia River Gorge National Scenic Area Ordinance

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance

UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

- a. Standards & Protocols –Develop monitoring standards and protocols.

Conservation Actions

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

- b. Project Monitoring – Follow up site restoration efforts with monitoring of conditions, adaptively managing site changes to achieve the desired end result.

Conservation Actions

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-209, Clark County Commission, Phase 2, Overall County Monitoring Locations

- c. Basin Recovery – Using a set of environmental indicator measures periodically assess status of recovery efforts within identified reaches, streams, or basins to determine overall progress.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-251, Department of Ecology, Phase 2, TMDL Development

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

X. Factor for Decline: Impaired Water Quality

Description

The surface water quality standards for the state of Washington (Chapter 173-201A WAC) protect beneficial uses of our state's rivers, lakes and marine waters. In the context of the Lower Columbia Steelhead Conservation Initiative (LCSCI), the beneficial use of concern is the migration, spawning and rearing of steelhead. The water quality standards have both numeric and narrative components. The numeric standards vary according to the class of water under which each water body has been designated. Numeric standards are addressed first, beginning with temperature as the most consistently compromised parameter in the LCSCI area. Discussion of the narrative standards then follows. Tables in Appendix 5 show the stream segments in the LCSCI areas that are listed or are proposed for listing on the Clean Water Act 303(d) list as not meeting water quality standards. Also in Appendix 5 is a map of the LCSCI areas showing 303(d) listed streams and highlighting those that are listed due to elevated temperature. Another Table in Appendix 5 shows LCSCI stream segments that are included in Washington's 305(b) report under the Clean Water Act because of impaired designated uses, but which have not had documented violations of water quality standards and, therefore, are not on the 303(d) list.

Elevated Stream Temperature

Temperature can be a limiting factor of steelhead habitat, and can exacerbate other factors affecting survival such as general metabolism, disease resistance, competition, and trophic interactions. Direct salmonid mortalities from elevated temperatures begin at 21 degrees C. Fish diseases associated with elevated water temperatures become problematic in the 13 degrees C to 18 degrees C range (Appendix C-14, April 2, 1997 draft of Wild Salmonid Policy). Water quality standards for fresh water are 16 degrees C for Class AA surface waters and 18 degrees C for Class A waters. Upper reaches of the Grays, Cowlitz, Toutle, Kalama, and East Fork Lewis Rivers are Class AA waters. The remainder of the waters are Class A.

The most profound influence by land management activities on stream temperature, particularly for smaller streams with low gradients, is through riparian vegetation removal or restoration. Other conditions affecting stream temperature are 1) the source and extent of contributions from groundwater inflow; 2) changes in stream channel morphology that result in increased scour or solar radiation accumulation, 3) the presence of permitted and unpermitted point source discharges warmer than ambient stream temperatures, 4) irrigation withdrawals and returns, and 5) the presence of impoundments that slow flows.

Activities that help decrease temperatures are: (1) increasing stream-side shade and reconnecting stream and floodplain interactions (see factor IX.); (2) increasing channel depth, complexity, and naturally occurring pools (see factor VIII.); (3) decreasing coarse and fine sediment inputs (See factor XI.); (4) managing point source discharges warmer than ambient stream temperatures; (5) managing surface and groundwater withdrawals; and (6) removing or modifying impoundments or other man-made impediments to flow.

Dissolved Oxygen, pH, Turbidity, Total Dissolved Gas

The numeric standards for these four parameters are set to levels that represent healthy conditions for aquatic organisms including steelhead. These parameters are highly dependent on local conditions and events.

High oxygen levels are important to steelhead both within surface waters and within subsurface environments such as spawning gravels. Low levels cause mortality of steelhead as well as macro invertebrates.

A pH range of 6.5 to 8.5 is the state's standard for protection of aquatic life. Stream chemistry changes result from interactions between levels of pH and other parameters. For example, as pH levels increase un-ionized ammonia also increases adding stress to aquatic organisms. In addition, the solubility of toxic metals also changes with different pH concentrations.

Turbidity levels are important to all life history stages of steelhead. High turbidity prevents feeding and can be especially detrimental to juveniles when levels are high for extended periods. As the fine to silty sediments settle out into streams, wetlands or lakes, they cover or are entrained in spawning gravels and rearing areas. Effects from settling of these sediments includes reduced survival to emergence for steelhead embryos, and loss of habitat for macro invertebrates important in the steelhead's diet.

The criterion for total dissolved gas is especially important where fish must pass through waters influenced by dams. Spilling water over dams can cause super saturation of total dissolved gasses with resulting injury, mortality or increased susceptibility to disease or predation. The state standard for total dissolved gas is 110% of saturation.

Contaminated Sediments

Hazardous substances introduced into the Lower Columbia from point and nonpoint human discharges and other natural sources may accumulate in river sediments in critical habitat areas. The Lower Columbia Bi-State Program identified fish exposure to sediment contaminants including heavy metals, PCBs, dioxin and furan congeners, organochlorine pesticides and some polynuclear aromatic hydrocarbons (PAHs). The potential exists for sediment contaminant impacts to fish health and populations, although studies to-date have been inconclusive.

Narrative Standards for Supported Uses

Besides specific numeric criteria for water quality parameters, the water quality standards must ensure that waters of the state support designated uses. These uses include the spawning, rearing and migration of salmonids. The aquatic environment needed to support these fish uses must include adequate physical, chemical and biological integrity to support a diversity of organisms, large and small. These, in turn, contribute to the nutrient cycling necessary to support the food web. Surface and ground waters are part of a larger landscape with constant interactions between organisms in the land, air and water.

Loss of surrounding upland and riparian habitat reduces the number and types of organisms that can interact with, and introduce organic matter into the water system. In developed areas, reduced inputs of naturally occurring components from the surrounding lands combined with increased pollutant loads from human activity results in a loss of balance in the cycle. The result can be reduced production in both the abundance and diversity of organisms. An over abundance of nutrients (nitrogen and phosphorus) in the system can also result in over production of some organisms (such as algae) leading to loss of clarity, depleted dissolved oxygen, changes in pH, etc. These all can lead to reduced diversity and vigor. As the biological diversity and abundance declines, the conditions for rearing new generations of steelhead deteriorate. Consequently, through the narrative standards, water quality includes the biological functions of diversity and food supply. Physical factors included in the narrative standards are addressed in the sections on sediment transport and fine sediments, basin hydrology and stream flow, decreased channel and floodplain complexity, and riparian areas and wetlands degradation. Chemical factors are addressed elsewhere in this section.

Objective (Temperature):

- A. To maintain water temperatures at or to restore water temperatures to levels that meet water quality standards throughout the Lower Columbia Steelhead Initiative Plan Area.

Interim Performance Measure:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI stream temperatures to meet state water quality standards.

Default Performance Measure:

Physical and chemical parameters such as temperature will meet or exceed state surface water quality standards, including narrative standards and anti-degradation provisions, for waters of the state as set under applicable law.

Conservation Strategies (Temperature):

1. As part of a comprehensive watershed-based approach to water quality and fish habitat, develop and implement with local stakeholders a plan to evaluate conditions and causes, prioritize needed protection and restoration actions, support education, model projects and local actions consistent with plans and monitor effectiveness of activities.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-151, Department of Ecology, Phase 1, Watershed Management

ECY-226-228, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment, Implementing Protection and Restoration Priorities, Assist Voluntary Stewardship of Wetlands

ECY-252-254, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management, Expanded Grant Funding, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DFW-101, Department of Fish and Wildlife, Phase 1, WRIP Process

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-204, Clark County Commissioners, Phase 2, Watershed Basin Planning

LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

LCC-205, Lewis County Commissioners, Phase 1, Cowlitz River Watershed Planning Grant Application

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance

SKP-107, Skamania County, Phase 1, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program

SKP-104, Skamania County, Phase 1, Comprehensive Plan “A”

SKP-201, Skamania County, Phase 2, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program

UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project

UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

2. For all waters, assist landowners, watershed councils, and local, state, and federal legislators and agencies to manage watersheds with methods that include stewardship programs and incentives that foster healthy stream conditions and meet state water quality criteria, including temperature.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-130, Department of Ecology, Phase 1, Levee Vegetation Standards Intergovernmental Committee

ECY-227, Department of Ecology, Phase 2, Implementing Protection and Restoration Priorities

ECY-228, Department of Ecology, Phase 2, Assist Voluntary Stewardship of Wetlands

ECY-252-254, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management, Expanded Grant Funding, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance

SKP-108, Skamania County, Phase 1, Rock Cove Environmental Evaluation and Comprehensive Plan

SKP-109, Skamania County, Phase 1, Skamania West End Water Quality Study

SKP-202, Skamania County, Phase 2, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-203, Skamania County, Phase 2, Skamania West End Water Quality Study
UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project
UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

3. For waters that do not meet state temperature criteria or are at risk of exceeding the criteria, prioritize critical reaches for restoration, identify likely or suspected causes of temperature increases, work with local landowners, agencies and groups to develop a range of preferred actions and prioritize for implementation.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-101-105, Department of Ecology, Phase 1, Continue Ambient Monitoring Program, Biodiversity and Habitat Monitoring, Limited Stream Temperature Monitoring Program, 303(d) Listing and Total Maximum Daily Loads (TMDL), Instream Flow Monitoring Stations
ECY-201-204, Department of Ecology, Phase 2, Expand Ambient Monitoring Program, Expand Biodiversity and Habitat Monitoring Program, Stream Temperature Monitoring Program, Expand Total Maximum Daily Load (TMDL) Program
ECY-206, Department of Ecology, Phase 2, Expand Instream Flow Monitoring Stations
ECY-251, Department of Ecology, Phase 2, TMDL Development
ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management
ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

4. Continuously monitor stream temperature throughout the summer in major reaches and tributaries currently exceeding state water quality standards to ensure progressive improvement in reaches.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan
ECY-103, Department of Ecology, Phase 1, Limited Stream Temperature Monitoring Program
ECY-156, Department of Ecology, Phase 1, Water Quality Monitoring
ECY-203, Department of Ecology, Phase 2, Stream Temperature Monitoring Program
ECY-253, Department of Ecology, Phase 2, Expanded Grant Funding
ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

SKP-108, Skamania County, Phase 1, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-109, Skamania County, Phase 1, Skamania West End Water Quality Study
SKP-202, Skamania County, Phase 2, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-203, Skamania County, Phase 2, Skamania West End Water Quality Study
UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project
UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

5. Focus compliance efforts and the management of NPDES permits with temperature components on prioritized stream reaches.

Conservation Actions

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance
CCC-207, Clark County Commissioners, Phase 2, NPDES Storm Sewer Permit

Objective (Dissolved Oxygen, pH, Turbidity, Total Dissolved Gas):

- A. Within the Lower Columbia Steelhead Initiative Plan Area maintain or restore dissolved oxygen, pH, turbidity and total dissolved gas to levels that meet water quality standards.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI streams to meet dissolved oxygen, pH, turbidity, and total dissolved gas standards.

Default Performance Measures:

Physical and chemical parameters such as dissolved oxygen, pH, turbidity, and total dissolved gas levels will meet or exceed state surface water quality standards, including narrative standards and anti-degradation provisions, for waters of the state as set under applicable law.

Conservation Strategies:

1. As part of a comprehensive watershed-based approach to water quality and fish habitat, develop and implement with local stakeholders a plan to evaluate conditions and causes, prioritize needed protection and restoration actions, support education, model projects and local actions consistent with plans and monitor effectiveness of activities.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-151, Department of Ecology, Phase 1, Watershed Management
ECY-156, Department of Ecology, Phase 1, Water Quality Monitoring
ECY-226, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment
ECY-253, Department of Ecology, Phase 2, Expanded Grant Funding
ECY-257, Department of Ecology, Phase 2, Assess Problem of and Solutions to Abandoned Farms

DFW-101, Department of Fish and Wildlife, Phase 1, WRIP Process
DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis
DOT-105, Department of Transportation, Phase 1, Erosion and Spill Control Lead
DOT-106, Department of Transportation, Phase 1, Water Quality Experimental Stations
DOT-110, Department of Transportation, Phase 1, Stormwater BMP Monitoring and Research
DOT-111, Department of Transportation, Phase 1, Stormwater BMP Design Optimization
DOT-112, Department of Transportation, Phase 1, Highway Stormwater BMP Retrofit Program
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program
CCC-204, Clark County Commissioners, Phase 2, Watershed Basin Planning
LCC-109, Lewis County Commissioners, Phase 1, Lewis County Goal/Vision Committee, Public Participation Plan for Initiating Watershed Planning
LCC-205, Lewis County Commissioners, Phase 1, Cowlitz River Watershed Planning Grant Application
SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance
SKP-107, Skamania County, Phase 1, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program
SKP-104, Skamania County, Phase 1, Comprehensive Plan “A”
SKP-201, Skamania County, Phase 2, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program
UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project
UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

2. For all waters, assist landowners, watershed councils, and local, state, and federal legislators and agencies to manage watersheds with methods that include stewardship programs and incentives that foster healthy stream conditions and meet these water quality criteria.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program
ECY-253, Department of Ecology, Phase 2, Expanded Grant Funding
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program
SKP-108, Skamania County, Phase 1, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-109, Skamania County, Phase 1, Skamania West End Water Quality Study
SKP-202, Skamania County, Phase 2, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-203, Skamania County, Phase 2, Skamania West End Water Quality Study
UCC-101, Underwood Conservation District, Phase 1, Wind River Watershed Project
UCC-201, Underwood Conservation District, Phase 2, Wind River Watershed Project

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3. For waters that do not meet the applicable criteria or are at risk of exceeding the criteria, prioritize critical reaches for restoration, identify likely or suspected causes of degradation, work with local landowners, agencies and groups to develop a range of preferred actions and prioritize for implementation.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-101-105, Department of Ecology, Phase 1, Continue Ambient Monitoring Program,
Biodiversity and Habitat Monitoring, Limited Stream Temperature Monitoring Program,
303(d) Listing and Total Maximum Daily Loads, Instream Flow Monitoring Stations
ECY-201-206, Department of Ecology, Phase 2, Expand Ambient Monitoring Program,
Expand Biodiversity and Habitat Monitoring Program, Stream Temperature Monitoring
Program, Expand Total Maximum Daily Load (TMDL) Program, Intergravel Dissolved
Oxygen Monitoring, Expand Instream Flow Monitoring Stations
ECY-251, Department of Ecology, Phase 2, TMDL Development
ECY-253, Department of Ecology, Phase 2, Expanded Grant Funding
DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group
Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group
Assistance
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

4. Focus compliance efforts and the management of NPDES permits with applicable components on prioritized stream reaches.

Conservation Actions

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance
ECY-253, Department of Ecology, Phase 2, Expanded Grant Funding
CCC-207, Clark County Commissioners, Phase 2, NPDES Storm Sewer Permit

Objective (Contaminated Sediments):

- A. Prevent physical adverse effects and reproductive and growth abnormalities in steelhead from exposure to sediment contamination

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for the LCSCI area to meet state criteria for stream sediment contamination.

Default Performance Measures:

Freshwater and estuary areas that affect salmonids should meet or exceed water and sediment quality criteria, as established for toxic or deleterious pollutants that can affect the survival, growth, or reproductive success of salmonids or prey species. These areas will also meet or exceed human health standards for fish consumption.

Conservation Strategies:

1. Map and evaluate the location of known or suspected contaminated sediment locations with respect to critical and significant steelhead habitat and assess conditions to determine priorities for action.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

2. Develop and implement or support existing effective nonpoint source control programs giving priority to sources of PCBs, organochlorine pesticides, dioxins and furans, PAHs and heavy metals. These programs should include such elements as permits, technical assistance, hazardous waste collection, site cleanups and economic incentives.

Conservation Actions

CTE-101, Department of Community, Trade and Economic Development, Phase 1, Public Works Trust Fund (PWTF)

CTE-102, Department of Community Trade and Economic Development, Phase 1, Community Development Block Grants (CDBG)

ECY-151, Department of Ecology, Phase 1, Watershed Management

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance

ECY-251, Department of Ecology, Phase 2, TMDL Development

CCC-208, Clark County Commissioners, Phase 2, East Fork Lewis River Project

LCC-108, Lewis County Commissioners, Phase 1, Adoption of a On-Site Sewage System Operation and Maintenance Program

LCC-203, Lewis County Commissioners, Phase 1, Implementation of the On-Site Sewage Operation and Maintenance Program

3. Criteria, standards and appropriate guidelines should be developed and adopted for trace metals, dioxin and furans, pesticides, PAHs, radionuclides and tributyltin in sediments and tissue. Source control and cleanup action levels for sediment and water quality should be developed and adopted to protect key beneficial uses related to protection of steelhead and their key habitats.

Conservation Actions

DOT-108, Department of Transportation, Phase 1, Standard Plans and Specifications Updates

DOT-111, Department of Transportation, Phase 1, Stormwater BMP Design Optimization

4. Develop and implement a multi-state and federal agency long-term monitoring program that uses a set of environmental indicators to measure the trend of pollutant concentrations in water, sediment and tissue, determine the effectiveness of management measures and programs in an annual or biennial report.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-156, Department of Ecology, Phase 1, Water Quality Monitoring

Objective (Narrative Standards):

- D. Within the Lower Columbia Steelhead Initiative Plan area, maintain or restore adequate physical, chemical and biological integrity to waters in order to fully support or restore the spawning, rearing and migration needs of the steelhead at or near historic population levels.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI area streams to meet state water quality standards for physical, chemical, and biological integrity.

Default Performance Measures:

Maintain productive aquatic habitats for salmonids and their prey bases that contain a balanced, integrated community of organisms, having species composition, abundance, diversity, structure, and organization comparable to that in unimpacted reference ecosystems of the region.

Conservation Strategies:

1. In combination with physical and chemical integrity factors covered elsewhere, develop bioassessment information on targeted water bodies and stream reaches. Use this information as part of a comprehensive watershed based approach to determine priorities, monitoring, evaluation, preservation and restoration needs.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-151, Department of Ecology, Phase 1, Watershed Management

ECY-156, Department of Ecology, Phase 1, Water Quality Monitoring

ECY-202, Department of Ecology, Phase 2, Expand Biodiversity and Habitat Monitoring Program

ECY-252-254, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management, Expanded Grant Funding, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

DOT-110, Department of Transportation, Phase 1, Stormwater BMP Monitoring and Research

DOT-111, Department of Transportation, Phase 1, Stormwater BMP Design Optimization

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2. Where the aquatic community is degraded identify causes, alternatives for restoration and the means to implement restoration measures.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-101-105, Department of Ecology, Phase 1, Continue Ambient Monitoring Program, Biodiversity and Habitat Monitoring, Limited Stream Temperature Monitoring Program, 303(d) Listing and Total Maximum Daily Loads (TMDL), Instream Flow Monitoring Stations

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-201-206, Department of Ecology, Phase 2, Expand Ambient Monitoring Program, Expand Biodiversity and Habitat Monitoring Program, Stream Temperature Monitoring Program, Expand Total Maximum Daily Load (TMDL) Program, Intergravel Dissolved Oxygen Monitoring, Expand Instream Flow Monitoring Stations

ECY-251, Department of Ecology, Phase 2, TMDL Development

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DOT-112, Department of Transportation, Phase 1, Highway Stormwater BMP Retrofit Program

DOT-202, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

3. Where the aquatic community in priority areas is healthy, work with local agencies and stakeholders to maintain stewardship activities in the areas.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

ECY-256, Department of Ecology, Phase 2, Timber Fish and Wildlife Technical Assistance

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

4. Develop a set of environmental indicators to monitor long-term stream health.

Conservation Actions

CRE-103, Columbia River Estuary Program, Phase 1, Lower Columbia River Long Term Monitoring Plan

ECY-154, Department of Ecology, Phase 1, Commercial Agriculture and Dairy

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

DFW-208, Department of Fish and Wildlife, Phase 2, Habitat Monitoring

DOT-110, Department of Transportation, Phase 1, Stormwater BMP Monitoring and Research

XI. Factor for Decline: Sediment Transport and Fine Sediments

Description:

High sediment loads can impair steelhead production in several ways. Excessive fine sediment in spawning nests (redds) can suffocate incubating eggs and alevins. A too thick layer of fine sediment can entrap fry in the incubation gravel, preventing or delaying emergence and reducing egg-to-fry survival. Incubation success is also reduced in spawning areas that receive too much coarse sediment. When spawning areas receive an excessive amount of gravel, they become unstable resulting in egg pocket burial or scour. Course and fine sediments fill pools resulting in less rearing space for salmonids. When suspended in the water column, fine sediment can impair feeding, and thereby influence growth rates and emigration timing. In winter, juvenile steelhead regularly seek refuge from near-freezing temperatures and high flows in cobble and boulder substrates. Excessive fine sediment can diminish the stability and the amount of interstitial space available in these habitats, resulting in reduced over winter survival of steelhead.

Land management activities have contributed greatly to high sediment loads in streams of the LCSCI area. Timber harvest near stream courses and on unstable slopes, poorly located, constructed and maintained roads, agricultural runoff, and residential development all produce excess sediments. Sediment delivery can occur slowly over time or in pulses, such as following mass wasting events. Curtailing sediment input to stream systems from human activities and returning sediment input to a more naturally occurring range must occur before restoration activities will become effective.

The most notable land-use activities influencing sediment delivery to streams are timber harvest, road construction and maintenance, residential development, and agricultural practices. Mass wasting events have been estimated to increase 2-4 times after clear-cutting in forest lands of western Washington (Ice 1985). Within the LCSCI area, heavy logging has caused high siltation rates and abundance in the Kalama River, Little Kalama River, and Arnold, Lost, and Elk Creeks (USFS 1996). Houpt et al. (1994) observed that Hemlock Creek (Cowlitz basin) has a recurrent incidence of eroded banks due, in part, to past logging practices. Watershed analysis in the upper Coweeman River revealed that abundant fine sediment observed in spawning-sized gravel patches was likely a result of mass wasting and eroding banks (Weyerhaeuser 1996). Similarly, fine sediment delivery to spawning habitat in the Elochoman drainage has been described as a result of mass wasting, and road construction and maintenance associated with timber harvest (WDNR et al. 1996). Extensive logging and road construction have also caused excessive siltation, denuded

banks, and have been associated with mass wasting events in the Willapa River basin (Phinney and Bucknell 1975).

Live stock agriculture has also contributed to excessive fine sediment in streams. Aylesworth et al. (1995) noted significant sediment input from agricultural land-use in the lower Arkansas Creek basin. In eighty nine percent of inventoried pastures hoofed animals had free access to the stream, degrading banks and contributing to fine sediment erosion. Houpt et al. (1996) noted that 30% of inventoried stream banks associated with live stock grazing in the Silver lake watershed were eroded. They also described 54% of pastures in the survey were in poor condition, further contributing to fine sediment delivery to stream channels.

Unpaved logging roads are perhaps the most pervasive mechanism of fine sediment delivery to stream channels. Poor road construction and maintenance practices have increased erosion rates and abundance into streams in the upper Kalama watershed (USFS 1996). Sediment delivery to streams may occur as mass wasting events or as chronic inputs. Sediment delivery can result from chronic bank erosion that can be abated using bioengineering and revegetation techniques that can both reduce erosion and sediment and create habitat. In the Clearwater River, the amount of fine sediment that washed off of unpaved roads equaled the amount produced by landslides, and has contributed to poor spawning habitat for salmonids in the basin (Reid and Dunne 1984). Cederholm et al. 1981, observed that fine sediment in spawning gravels exceeded natural levels when more than 2.5% of the watershed was covered by unpaved roads. They found that mass wasting and logging roads were correlated with fine sediment concentrations.

Objective:

- A. Course and fine sediments will not persist above natural background levels so as to impair steelhead and other salmonid productivity.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI streams to restore sediment transport to natural levels.

Default Performance Measures:

Spawning areas are impaired if fine sediments (<.85mm) among spawning gravel exceeds 11%. However, if fine sediment levels naturally exceed 11% in spawning or rearing habitat, then sediment concentrations should not exceed natural levels.

Conservation Strategies:

1. Assess fine sediment intrusion in streams using criteria that include: spawning gravel quantity and quality (% fines), and substrate composition. This may include monitoring stream cross-sections to measure impacts from deposition and scour.

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-256, Department of Ecology, Phase 2, Timber Fish and Wildlife Technical Assistance
DFW-201, Department of Fish and Wildlife, Phase 2, Watershed Assessment/Analysis
DOT-109, Department of Transportation, Phase 1, Erosion Control Outreach

- a. Establish priorities within the LCSCI area to protect high quality spawning and over-wintering habitat.
2. Cease or modify land use activities that produce excess coarse and fine sediments.

Conservation Actions

ECY-251-254, Department of Ecology, Phase 2, TMDL Development, Multi Agency Team Approach to Watershed Management, Expanded Grant Funding, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

ECY-256, Department of Ecology, Phase 2, Timber Fish and Wildlife Technical Assistance

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance

SKP-104, Skamania County, Phase 1, Comprehensive Plan "A"

SKP-108, Skamania County, Phase 1, Rock Cove Environmental Evaluation and Comprehensive Plan

SKP-109, Skamania County, Phase 1, Skamania West End Water Quality Study

SKP-202, Skamania County, Phase 2, Rock Cove Environmental Evaluation and Comprehensive Plan

SKP-203, Skamania County, Phase 2, Skamania West End Water Quality Study

- a. Work cooperatively with local, state, and federal agencies to initiate an education program that heightens awareness on fine sediment detriments to fish life, its sources, and alternatives to common land management activities that produce fine sediment. The program should include a pamphlet that accompanies all building permits, forestry permits, water withdrawal permits, and hydraulic permits. General mailings throughout the LCSCI area would be promoted.

Conservation Actions

DFW-104, Department of Fish and Wildlife, Phase 1, Informational Materials

DFW-105, Department of Fish and Wildlife, Phase 1, Community Events

DFW-203, Department of Fish and Wildlife, Phase 2, Community Events

DOT-103, Department of Transportation, Phase 1, Erosion and Sediment Control Training

DOT-202, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

CCC-208, Clark County Commissioners, Phase 2, East Fork Lewis River Project

LCC-106, Lewis County Commissioners, Phase 1, Development of Stormwater Management Ordinance

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- b. Discourage development in floodplain areas, estuarine wetlands or sensitive (high potential for sediment delivery to stream channels) upland areas through county, city, and state government forums and procedures.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-127, Department of Ecology, Phase 1, Regulatory Approaches to Minimize Land Use Impacts
ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
CCC-109, Clark County Commissioners, Phase 1, Floodplain Combining District
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance
COC-102, Cowlitz County Commissioners, Phase 1, Environmental Policy
COC-103, Cowlitz County Commissioners, Phase 1, Shorelines Management
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan
LCC-101, Lewis County Commissioners, Phase 1, Amendment to the Shorelines Master Program

- c. Work closely with other state and local government agencies and major landowners to develop and implement best management practices to reduce high sediment delivery to stream channels from activities such as timber harvest, road construction, and agricultural practices.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
DOT-110, Department of Transportation, Phase 1, Stormwater BMP Monitoring and Research
COC-103, Cowlitz County Commissioners, Phase 1, Shorelines Management

- d. Work closely with landowners and volunteer groups to coordinate fencing and vegetative plantings in floodplains of agricultural (grazing and farming) land uses.

Conservation Actions

DFW-106, Department of Fish and Wildlife, Phase 1, Volunteer Restoration Group Assistance
DFW-204, Department of Fish and Wildlife, Phase 2, Volunteer Restoration Group Assistance
DOT-204, Department of Transportation, Phase 2, Biomaterials Exchange
DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

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- e. Encourage the enforcement of state water quality standards regarding fine sediment (turbidity) when violations occur.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
DFW-116, Department of Fish and Wildlife, Phase 1, Enforcement
DOT-105, Department of Transportation, Phase 1, Erosion and Spill Control Lead
CCC-117, Clark County Commissioners, Phase 1, Code Enforcement

- f. Encourage mitigation measures that benefit steelhead habitat when state water quality standards regarding fine sediment (turbidity) are violated.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

- g. Encourage local government adoption of storm water criteria that meet state water quality standards.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan
CCC-103, Clark County Commissioners, Phase 1, Stormwater Control Ordinance
CCC-104, Clark County Commissioners, Phase 1, Erosion Control Ordinance
LCC-106, Lewis County Commissioners, Phase 1, Development of Stormwater Management Ordinance

- h. Promote adoption of critical area protection ordinances by local governments for steep slopes with high erosion and sedimentation potential.

Conservation Actions

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance
DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
CCC-105, Clark County Commissioners, Phase 1, Excavation and Grading
CCC-106, Clark County Commissioners, Phase 1, Geological Hazard Ordinance
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

- i. Ask the TFW process and the Forest Practices Board to consider more stringent protection for slopes greater than 70% or other slopes based upon the underlying geology.

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3. Identify and protect areas that have low fine sediment in spawning gravels.

Conservation Actions

ECY-251, Department of Ecology, Phase 2, TMDL Development

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection

ECY-256, Department of Ecology, Phase 2, Timber Fish and Wildlife Technical Assistance

- a. Engage with landowners and land managers to identify those elements in their land use practices that are maintaining low fine silt abundance; encourage them to maintain their stewardship and promote their practices as demonstration projects for others.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

- b. Promote incentives for stream-side stewards who voluntarily protect landscapes that buffer fine sediment delivery to stream channels.

Conservation Actions

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

CCC-101, Clark County Commissioners, Phase 1, Habitat Conservation Ordinance

- c. Work cooperatively and proactively with land owners to protect streams from fine sediment delivery due to future land use activities.

Conservation Action

DNR-107, Department of Natural Resources, Phase 1, Jobs for the Environment Program

4. Ensure state and state-sponsored, local government and major forest landowner's road construction personnel and equipment adequately address stream protection regarding fine sediment production and delivery.

Conservation Actions

ECY-251, Department of Ecology, Phase 2, TMDL Development

DOT-103, Department of Transportation, Phase 1, Erosion and Sediment Control Training

DOT-105, Department of Transportation, Phase 1, Erosion and Spill Control Lead

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- a. Issue certification in Construction Site Erosion and Sediment Control courses.

Conservation Actions

DOT-103, Department of Transportation, Phase 1, Erosion and Sediment Control Training

DOT-202, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

- b. Include contract specification requiring contractors to have available a person certified in the above course on contracts that involve activity in or near waters of the state. These projects include those requiring a HPA permit when at least 0.5 acres of earthwork is involved.

Conservation Action

DOT-105, Department of Transportation, Phase 1, Erosion and Spill Control Lead

- c. Keep operation of two water quality experimental stations current and progressive – Green Valley in Wenatchee and Black Hills near Olympia- to investigate and advance erosion control practices, products, and methodologies.

Conservation Action

DOT-106, Department of Transportation, Phase 1, Water Quality Experimental Stations

- d. Review all products used on WSDOT jobs through the New Product Evaluation Committee and evaluate them based on potential harm to salmonids and general environmental degradation. All erosion control products currently used have already or will go through this evaluation in the future.

Conservation Actions

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance

DOT-107, Department of Transportation, Phase 1, New Product Evaluation Committee

- e. Revise plans, guides, specifications, and estimates to reflect improvements in erosion and sediment control procedures, methods, and effectiveness.

Conservation Actions

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance

DOT-108, Department of Transportation, Phase 1, Standard Plans and Specifications Update

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- f. Advance outreach including information sharing via WSDOT Water Quality web site.

Conservation Action

DOT-109, Department of Transportation, Phase 1, Erosion Control Outreach

- g. Promote recognition of outstanding work, innovations or contributions to reduce sedimentation during road construction and maintenance.

XII. Factor for Decline: Basin Hydrology and Stream Flow

Description

Very low seasonal stream flows are a natural occurrence in some tributaries to the lower Columbia River, especially in low elevation basins that rely almost completely on rainfall as opposed to those that rely on snow melt and/or glacial melt. The climate of the low elevation parts of the region is generally mild temperatures and rain during the winter and spring and warm and dry during the summer and early fall. Consequently, low elevation streams (e.g. Salmon Creek, Elochoman River, Grays River) have peak flows during winter storms and low flows throughout the summer and early fall after extended periods without rain when the base flow is provided wholly by the discharge of ground water into stream channels. See Figure 2, Hydrograph of the Grays River.

Discharge duration hydrographs like Figures 2 and 3 are derived by statistical analysis of the daily flow values recorded by a stream gauge over an extended period of time. The upper line on the hydrograph depicts the flow that is met or exceeded only ten percent of the time on any given day. The middle line depicts the median flow on any given day, that is, the flow that is met or exceeded fifty percent of the time. The lower line is the flow that is met or exceeded ninety percent of the time on any given day. Hydrographs illustrate the general pattern of stream flow that can be expected during various seasons of the year. They also give a general indication of the water availability situation for a river or stream.

The rivers that drain the Cascade Mountains (Cowlitz, Lewis, Toutle, Kalama, Wind) have a snow melt and/or glacial melt component to runoff. These rivers may have very high, short term flows in winter due to rain and snow melt events associated with warm Pacific storms, but their runoff volume also normally peaks during the spring when warmer temperatures trigger the melt-off of snow accumulated during the prior winter. By mid July, the snow is usually gone at which times flows recede until the fall rains begin. Glacial melt is a factor that contributes to relatively robust runoff during the summer and fall on the Cowlitz River. See Figure 3, Hydrograph of the Cowlitz River.

Low summer/fall flows are exacerbated by the extraction of water from streams or from hydraulically connected groundwater for agricultural, municipal, domestic or commercial or industrial uses. Under current conditions, significant surface and ground water withdrawals

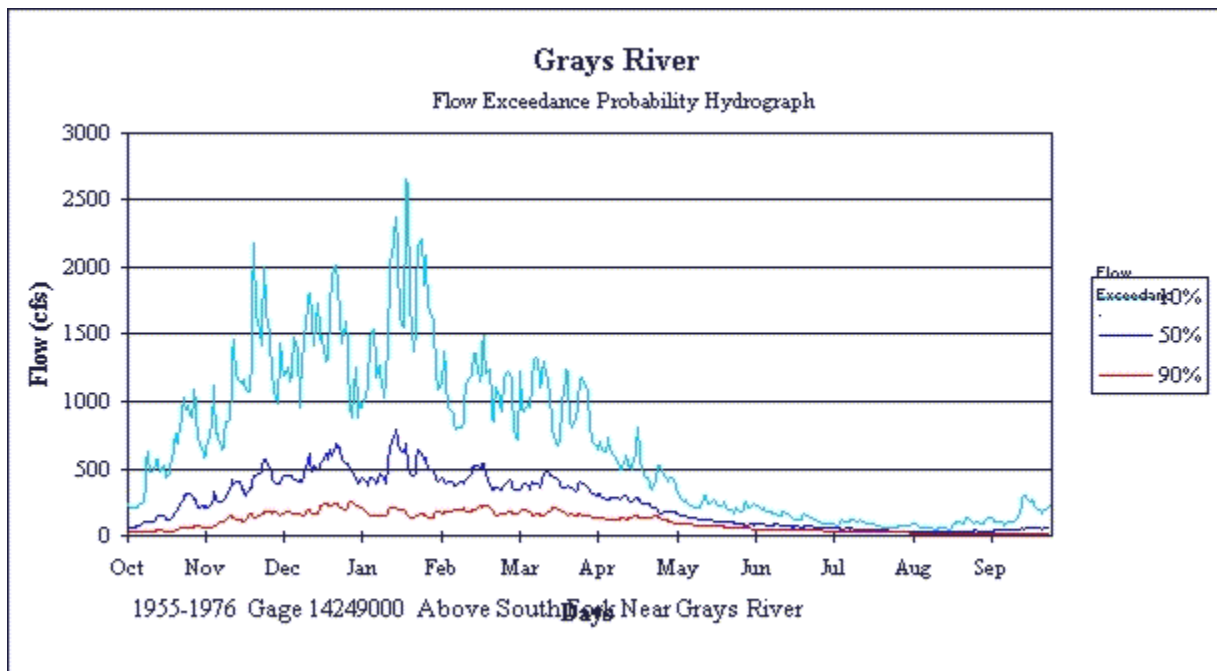


Figure 2. Flow exceedance probability hydrograph of the Grays River.

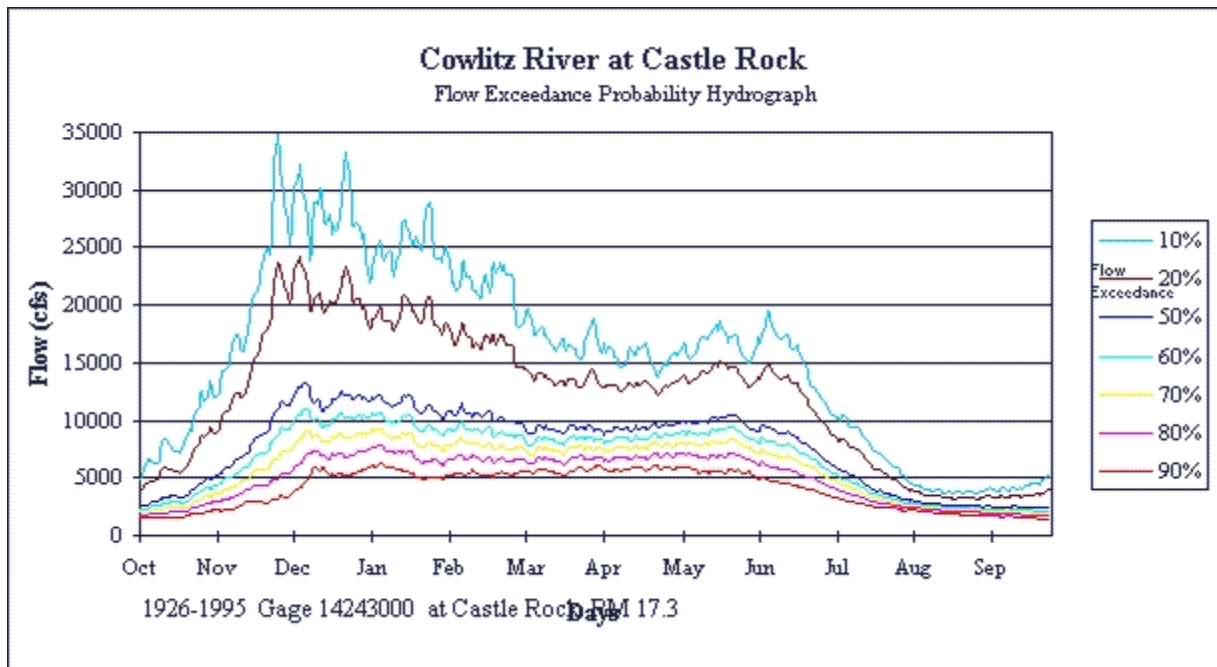


Figure 3. Flow exceedance probability hydrograph of the Cowlitz River.

occur only within the East Fork Lewis, Salmon Creek (near Vancouver), Lacamas (near Camas), and Washougal basins, all of which drain the rapidly urbanizing areas of Clark County. Clark County has undertaken surface and ground water monitoring and studies in the East Fork Lewis, Salmon and Lacamas basins. Other tributary streams within the Lower Columbia ESU are vulnerable to future surface and ground water extractions as development spreads along the Interstate 5 corridor and into the Columbia Gorge. Skamania County has undertaken a water quality study that is looking at water quantity issues as well.

Much of Clark County is rapidly developing. If care is not taken, development may indirectly reduce the flows present during the low flow period of the year. Urban development tends to increase impervious surface area and alter ground water recharge areas. These changes cause surface flows to be flashier (higher highs and lower lows) and to decrease groundwater storage. These changes usually cause base flows (the flow present after a dry weather period) to decline, thus impacting aquatic resources.

Four streams in or near the LCSCI have major hydroelectric projects on them. These are the Columbia River, the Cowlitz River, and the Lewis River within the LCSCI area, and the White Salmon River adjacent to the LCSCI area. Hydropower issues are discussed in a separate section of this chapter.

All stream channels are affected by natural high water events (i.e. floods), which can be both beneficial and detrimental to fish and fish habitat. Floods deliver nutrients, replenish gravel spawning substrate, and provide large woody debris (trees, rootwads) that contribute to the creation of pools and provide cover for fish at various flows. Floods can refresh stream systems by washing fine sediment from spawning gravel, but in extreme events may also negatively impact fish by washing deposited eggs from the gravel. The natural range of flood events has resulted in the stream characteristics (channel width and depth, gravel size, pool/riffle ratios, etc.) to which fish have adapted. However, land management activities can sufficiently alter the magnitude of floods and the ability of the channel and floodplain to ameliorate their effects; resulting in poor or nonproductive habitats.

Urban development significantly increases the amount of surface area that is impervious to water penetration. Streams in watersheds with as little as 5-10% impervious area have been substantially altered due to the accelerated rate of stormwater runoff and the associated reduction in groundwater contribution to streams. This stormwater runoff increases both the frequency and magnitude of high flow events, altering stream habitat conditions, and typically also resulting in decreased summer flows needed to support juvenile salmonid production. The increased stormwater runoff often causes increased local flooding and streambank erosion. The flood flow may be in excess of the flow that road crossing structures, such as culverts, were designed to accommodate, resulting in washout of the road and major impacts to stream habitat. High flows from urban areas result in a simplification of the stream channel that is more suited to moving high volumes of water than providing fish habitat.

It is also important to retain the integrity of the channel floodplain. Associated side channels, many of which are dry during low flow periods in the main channel, are important refuge habitats

for adult and juvenile salmonids at high flow events. Without this refuge, salmonids may be pushed downstream or otherwise not survive the increased velocities that occur at high flows. The installation of tide gates, diking, and drainage of associated Lower Columbia wetlands has significantly altered channel morphology and flows, and has impaired salmonid production potential. Diking concentrates stream energy and elevates flood peaks, resulting in increased scouring of spawning areas, loss of channel complexity due to loss of large woody debris and other structural elements, and the loss of pools, all of which are important to both juvenile and adult salmonids.

Timber harvest patterns can also have a detrimental effect on water runoff. Mature trees provide a tremendous amount of surface area for intercepting and slowing the rate that precipitation reaches the ground. A landscape that contains clearcuts and stands of very young trees is less able to slow runoff from major storms than is a mature forested landscape. This difference is especially evident during rain-on-snow events. In a mature forested environment, much of the snowfall at mid-elevations is captured in the tree branches where it melts rather quickly following the storm. Snow reaches the ground where clearcuts and very young stands exist. On the ground, less surface area is exposed to wind; therefore, the snow melts at a much slower rate. It often accumulates with additional snowfalls. A rain-on-snow event occurs when a warmer rainstorm event occurs often accompanied by wind which quickly melts the accumulated snow and adds it to the runoff from the rainstorm event itself.

Forest roads are another factor contributing to higher runoff rates. Forest roads typically service mountainous terrain. The roads are impervious surfaces that collect runoff and route it into roadside ditches. The construction of these roads on the hillside often results in the interception of shallow groundwater that ends up in the ditch as well. The ditches become extensions of the natural channel network, delivering runoff and intercepted groundwater to streams at a much higher rate than the hillside that formerly existed.

High flows tend to affect steelhead less severely than they affect fall-spawning salmonids. The greatest effect of high flows on steelhead is through disruption of channel morphology and through sediment movement. Both of these effects are interactive with land use in the watershed; as disturbance from land use increases the adverse effect of high flows on steelhead also increases.

High flows can move gravel, larger rock, finer sediment, and large woody debris. Under worst cases, high flows can cause channel shifts that strand rearing juvenile steelhead, cause direct mortality by grinding and crushing young steelhead buried in the gravel during winter, and can remove large woody debris that provides and controls habitat. Large woody debris that spans stream channels dissipates energy of high flows, thereby reducing the potential for channel damage from high flows. Intact watersheds (few or no roads, mature forest) are less susceptible to impacts of high flows than watersheds impacted by land use. Impervious surfaces (pavement, roofs) exacerbate high flows, but wetlands reduce the intensity of high flows. Intact vegetation minimizes input of fine sediment during high flows and heavy precipitation.

In streams with dams and regulated flows, high flows during the steelhead spawning season (April-May) can be detrimental if they are followed by significant flow reductions later during the

incubation season (June-July). Such high flows can induce steelhead to spawn higher up on the edge of the channel where subsequent flow reductions will leave the redds (nests) dewatered, resulting in death of eggs or alevins and reproductive failure.

Porous soils retain rainwater and release it slowly through time. Impervious and compacted soils prevent infiltration of water from occurring and thus create immediate runoff of rainfall. The hydrologic response to hardened landscapes is nearly immediate. Streams draining hardened landscapes rise quickly after storm events, causing an increase in the frequency and magnitude of flood events. Conversely, in the low flow periods of summer, compact soils contribute relatively little stored water to stream channels. Compacted soils result from urbanization, rural development, live stock agriculture, and from traditional clear-cut timber practices. In west-side forests, clear-cuts exceeding 20-30% of watershed area have increased water yield, largely due to decreased evapotranspiration (Bosch and Hewlett 1982). Harr and Cundy (1992), reported that water yield may not return to background levels following clear-cuts for 30-40 years, when evapotranspiration rates increase to preharvest levels. Within the LCSCI area, clear-cutting whole subwatersheds in the Kalama basin may have increased peak flow frequencies (USFS 1996). Beschta et al (1995) reported increases in peak flow frequencies following timber harvest in an analysis of western Oregon streams.

Objective:

- A. Ensure stream flows are sufficient to protect and enable restoration of steelhead and other aquatic resources.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks to establish, protect and restore LCSCI area stream flows at levels sufficient for steelhead and other salmonids.

Default Performance Measures:

In streams or basins that provide useable wild salmonid habitat, and where stream flows have been adopted or are being revised, the performance measure will be the stream flow as adopted by rule. Where review is requested the objective will be to establish or revise stream flows to optimize habitat conditions for migration, spawning incubation, and rearing of wild salmonids and their prey.

Conservation Strategies:

1. Determine on a stream-by-stream basis, whether instream flows are problematic and the specific cause of any problems identified.

Conservation Actions

ECY-151, Department of Ecology, Phase 1, Watershed Management

ECY-251, Department of Ecology, Phase 2, TMDL Development

- a. Carry out an assessment of the water situation in each fish producing tributary in the Lower Columbia ESU.

Conservation Actions

ECY-105, Department of Ecology, Phase 1, Instream Flow Monitoring Stations
ECY-176, Department of Ecology, Phase 1, Watershed Assessment (WRIA 28 only)

ECY-206, Department of Ecology, Phase 2, Expand Instream Flow Monitoring Stations

ECY-276), Department of Ecology, Phase 2, Watershed Assessments

- b. Determine whether instream flows are now or could become a factor limiting production of fish.

Conservation Actions

ECY-176, Department of Ecology, Phase 1, Watershed Assessment (WRIA 28 only)

ECY-276, Department of Ecology, Phase 2, Watershed Assessments

- 2. Establish instream flows on priority streams and river segments in which instream flows are now or are likely to become a limiting factor for fish production.
 - a. Determine priority streams for establishing flows based on immediacy of the threat.

Conservation Action

ECY-277, Department of Ecology, Phase 2, Instream Flow Priorities

- b. Withhold action on new and pending water rights, including a moratorium on exempt wells on a watershed basis where continuity between surface and ground water is determined to exist by the Department of Ecology, until flows are adopted.

Conservation Action

ECY-278, Department of Ecology, Phase 2, Withhold Action on Water Rights

- c. Notify state and local planning agencies of decisions to withhold actions on new and pending water rights until flows are adopted.

Conservation Action

ECY-278, Department of Ecology, Phase 2, Withhold Action on Water Rights

- d. Determine willingness of counties and local utilities to cooperate in studies and flow establishment.

Conservation Action

ECY-279, Department of Ecology, Phase 2, Determine Instream Flow Needs

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- e. Carry out instream flow studies on priority streams and river segments, using methods agreed upon by Ecology and DFW. Based on study results, consult with DFW, affected tribes and other interested parties on flow needs for steelhead and other salmonids.

Conservation Action

ECY-279, Department of Ecology, Phase 2, Determine Instream Flow Needs

- f. Adopt instream flows and/or stream closures by administrative rule through a public process in connection with a local watershed plan, if any, or if no such plan is under development, on Ecology's own initiative.

Conservation Action

ECY-280, Department of Ecology, Phase 2, Adopt Instream Flows

- 3. Monitor and protect the adopted instream flows from diminishment.

- a. Use adopted instream flows to condition any future water rights.

Conservation Action

ECY-281, Department of Ecology, Phase 2, Condition/Deny Water Rights and Water Quality Certifications

- b. Deny new rights on closed streams and prohibit establishment of exempted wells where hydraulic continuity with the stream is determined to exist.

Conservation Action

ECY-281, Department of Ecology, Phase 2, Condition/Deny Water Rights and Water Quality Certifications

- c. Notify state and local planning agencies of decisions to deny new rights on closed streams.

Conservation Action

ECY-281, Department of Ecology, Phase 2, Condition/Deny Water Rights and Water Quality Certifications

- d. Enforce against illegal and excessive water diversions and withdrawals.

Conservation Action

ECY-283, Department of Ecology, Phase 2, Assuring Compliance

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- e. Advocate the adopted instream flows with regard to any new development projects requiring a federal permit or license.

Conservation Action

ECY-281, Department of Ecology, Phase 2, Condition/Deny Water Rights and Water Quality Certifications

- f. Work with local governments to preserve and enhance wetlands and groundwater recharge areas. Acquire conservation easements if necessary.

Conservation Actions

ECY- 226-228, Department of Ecology, Phase 2, Riparian and Wetland Habitat Assessment, Implementing Protection and Restoration Priorities, Assist Voluntary Stewardship of Wetlands

CCC-205, Clark County Commissioners, Phase 2, Coordinated Water System Plan
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance

- g. Establish new stream gauging stations as needed to monitor streamflow conditions.

Conservation Actions

ECY-206, Department of Ecology, Phase 2, Expand Instream Flow Monitoring Stations

ECY-282, Department of Ecology, Phase 2, Establish or Upgrade Streamflow Monitoring

CCC-209, Clark County Commissioners, Phase 2, Overall county Monitoring Locations

- h. Regulate conditioned water rights and water rights junior to acquired instream flows.

Conservation Action

ECY-283, Department of Ecology, Phase 2, Assuring Compliance

- i. Relinquish unused right to eliminate the potential for illegal reactivation.

Conservation Action

ECY-283, Department of Ecology, Phase 2, Assuring Compliance

- 4. Enhance existing instream flow conditions.

- a. Prioritize streams for acquisition of water rights based on instream flow goals and shortfalls.

Conservation Action

ECY-284, Department of Ecology, Phase 2, Acquire Trust Water Rights

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- b. Acquire existing water rights by purchase, lease, receipt of gift, or conservation for dedication to the state Trust Water Rights Program. To the extent possible, cost share these acquisitions with federal and private foundation funds.

Conservation Action

ECY-284, Department of Ecology, Phase 2, Acquire Trust Water Rights

- c. Establish water use quantity standards by rule; ideally in conjunction with a watershed management plan.

Conservation Action

ECY-285, Department of Ecology, Phase 2, Water Use Quantity Standards

- d. Require installation of measuring devices on all existing surface water diversions and on those groundwater wells claiming rights to withdraw more than 10 gallons per minute where such diversions or withdrawals are determined to impair streams supporting anadromous fish.

Conservation Action

ECY-286, Department of Ecology, Phase 2, Measuring Devices

- e. Help local governments develop landscaping codes to reduce demand for summer landscape irrigation.

Conservation Actions

ECY-287, Department of Ecology, Phase 2, Low Water Use Landscaping

CCC-119, Clark County Commissioners, Phase 1, Landscaping

- f. Establish technical assistance, model demonstration projects and financial incentives for persons willing to convert to low water use landscaping and/or to retrofit low water use plumbing fixtures.

Conservation Action

ECY-287, Department of Ecology, Phase 2, Low Water Use Landscaping

Objective:

- B. Ensure watershed processes reflect natural basin hydrology and support healthy salmonid productivity.

Interim Performance Measures:

By June, 1998 develop quantifiable measures and benchmarks for LCSCI watersheds to restore natural basin hydrology as needed for healthy populations of steelhead and other salmonids.

Default Performance Measures:

Physical indicators within a watershed should also be used, where applicable, as performance measures to assess or achieve the goals for basin hydrology and stream flow. These performance measures are typically expressed as thresholds of change – if the thresholds are exceeded, habitat conditions including water quality and water quantity decline dramatically, and often irreversibly. Threshold management can help to maintain or restore natural basin hydrology and stream flow. Examples of thresholds include:

- a. Percent effective impervious surfaces – including road surfaces, rooftops, compacted soils, and parking lots. As percent effective impervious area exceeds a threshold range of 5-10 percent in a subbasin watershed, stream conditions (including the frequency and intensity of high flows and water quality) begin to deteriorate. Groundwater recharge and summer low flows also usually decline, although the relationship is not always as predictable. The threshold may be applied to stream reaches, subbasins, or wetlands. In subbasins where the threshold has been exceeded, there will be a joint assessment to determine what useable wild salmonid habitat remains and evaluate the effectiveness of existing or proposed stormwater controls using the best available science.
- b. Forest harvest and road density – the seasonal timing of forest harvests, and the density of roads in harvesting areas, can have significant effects on stream flows. The percent of upland forests at hydrologic maturity, and percent clearcut in rain-on-snow zones, have been used as thresholds beyond which significant adverse impacts on basin hydrology and stream flow will be expected. The thresholds are basin specific. For western Washington subbasin watersheds, a threshold of approximately 60% of standing timber at age 25 or more will begin to reflect hydrologic maturity. The effect of road densities is even more basin specific and will require some form of analysis and discussion to arrive at a threshold number, or other management prescription, to protect against unnaturally high stream flows.
- c. Threshold grazing standards should be set at the basin specific level. On state lands, guidance is available in the HB 1309 Ecosystem Standards for State-Owned Agricultural and Grazing Lands. This guidance may also have application on other ownerships as a reference document.

Conservation Strategies:

1. Protect and, where possible, restore watershed processes that reflect natural basin hydrology.

Conservation Actions

ECY-151, Department of Ecology, Phase 1, Watershed Management

ECY-251, Department of Ecology, Phase 2, TMDL Development

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254-256, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection, Barrier, Culverts and Stream Retyping, Timber Fish and Wildlife Technical Assistance

SKP-102, Skamania County, Phase 1, Skamania County Critical Areas Ordinance
SKP-103, Skamania County, Phase 1, State Environmental Policy Act (SEPA) Ordinance – SEPA Rules
SKP-104, Skamania County, Phase 1, Comprehensive Plan “A”
SKP-106, Skamania County, Phase 1, Skamania County Zoning Ordinance
SKP-107, Skamania County, Phase 1, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program
SKP-108, Skamania County, Phase 1, Rock Cove Environmental Evaluation and Comprehensive Plan
SKP-201, Skamania County, Phase 2, Shoreline Management Act Permit Ordinance – Shoreline Management Master Program
SKP-202, Skamania County, Phase 2, Rock Cove Environmental Evaluation and Comprehensive Plan

- a. Assist county governments in the use of low-density and low-intensity zoning in areas not designated as urban growth areas under GMA.

Conservation Actions

DFW-117, Department of Fish and Wildlife, Phase 1, GMA/SMA
CCC-111, Clark County Commissioners, Phase 1, Comprehensive Plan Policies
CCC-112, Clark County Commissioners, Phase 1, Agricultural/Wildlife Zoning
CCC-113, Clark County Commissioners, Phase 1, Rural and Resource Zoning
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan

- b. Assist management entities (city, county, state, federal and private) in the planning and construction of new roads near streams and within floodplains to avoid or minimize impacts to salmonids.

Conservation Actions

ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs
DFW-112, Department of Fish and Wildlife, Phase 1, Levees
DOT-203, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

- c. Assist forest products managers in the planning of harvest schedules and methods to minimize land-use impacts to stream hydrology and watershed processes, especially in sanctuary waters.
- d. Develop incentives and review and act on opportunities to remove or set back dikes and tide gates along stream courses to increase channel complexity and floodplain interaction and restore riparian function.
- e. Develop incentives to promote non-development activities in rural and forested areas to minimize impervious surfaces.

Conservation Action

CRE-101, Columbia River Estuary Program, Phase 1, CREP Management Plan

- f. Encourage local governments to adopt the Puget Sound Stormwater Management strategy.

Conservation Action

ECY-152, Department of Ecology, Phase 1, Permit Management and Compliance

- g. Develop plan and funding strategies for upgrading stormwater control in existing urban watersheds where needed.

Conservation Actions

ECY-153, Department of Ecology, Phase 1, State Grant and Loan Program

DOT-112, Department of Transportation, Phase 1, Highway Stormwater Retrofit Program

DOT-113, Department of Transportation, Phase 1, Capitol Budget Coordination

DOT-202, Department of Transportation, Phase 2, Stormwater Outfall Retrofit

- h. Require landowners to install stream crossings capable of accommodating 100-year flood flows. Where culverts are used at problem crossings, encourage the installation and maintenance of trash racks to prevent plugging of culverts during storms.

Conservation Action

COC-105, Cowlitz County Commissioners, Phase 1, Road Drainage and Fish Passage Improvements

- 2. Maintain stream channels in a condition that is resistant and resilient to high flows.

Conservation Actions

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

ECY-254-256, Department of Ecology, Phase 2, Forest Watershed Analysis of Targeted Basins for Restoration and Protection, Barrier, Culverts and Stream Retyping, Timber Fish and Wildlife Technical Assistance

- a. Maintain large woody debris in and adjacent to the stream channel.
- b. Maintain vegetation in riparian zone needed to maintain riparian function and protect wetlands and high flow channels.

Conservation Actions

ECY-127, Department of Ecology, Phase 1, Regulatory Approaches to Minimize Land Use Impacts

ECY-229, Department of Ecology, Phase 2, Updated Shoreline Master Programs
DOT-111, Department of Transportation, Phase 1, Stormwater BMP Design Optimization
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance

3. Maintain watersheds in condition to minimize high flows from high precipitation.

Conservation Action

ECY-252, Department of Ecology, Phase 2, Multi Agency Team Approach to Watershed Management

- a. Minimize impervious surfaces, maintain integrity of vegetative cover and maximize groundwater infiltration.

Conservation Action

CRE-101. Columbia River Estuary Program, Phase 1, CREP Management Plan
LCC-100, Lewis County Commissioners, Phase 1, GMA Critical Areas Ordinance and Comprehensive Land Use Plan
LCC-101, Lewis County Commissioners, Phase 1, Amendment to the Shorelines Master Program

- b. In suburban and urban areas with extensive impervious surfaces, create swales, stormwater holding ponds and other management practices as needed to reduce intensity of runoff and increase groundwater infiltration.

Conservation Action

DOT-111, Department of Transportation, Phase 1, Stormwater BMP Design Optimization
COC-101, Cowlitz County Commissioners, Phase 1, Critical Areas Ordinance

4. In streams with major water storage dams, maintain stable flows through salmonid incubation periods to avoid stranding redds (nests).